VOL 13
ISS 2
JA 8 79
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M Compatibles Compared . . . Page 10

COMPUTERWORLD

THE NEWSWEEKLY FOR THE COMPUTER COMMUNITY

ekly Newspaper .Second-class postage paid at Boston, Mass., and additional mailing offices ©1979 by CW Communications/Inc.

January 8, 1979

$1.00 a copy; $25/year

Los Angeles Times Photo

Monkeying Around

A microcomputer took on a beastly job and walked away with a beauty of a prize — the Princess Award for animation in the Tournament of Roses Parade. See story on Page 5.

Lid on Pay Raises May Hold DP Budget Increases to 8.4%

By Ann Dooley
CW Staff

If DP managers hold salary increases to 7%, as recommended by the Carter Administration, DP budgets for large systems users will rise only 8.4% during 1979, according to a recent *Computerworld* survey.

This will represent a significantly lower growth rate than the 10.6% overall rise predicted by CW a year ago for the same class of computer users.

Almost all of the 34 large systems users in the survey reported that they plan to follow the 7% salary guideline and that this was the major reason for the slowdown in budget growth. Nevertheless, 70% of the users said they did plan budget increases in the coming year, while 15% predicted a flat year and 9% expect to actually reduce spending.

The 7% salary increase lid in 1979 is significantly lower than the 11 2% increase in salaries reported for 1978 by similar firms, and the percent expecting to increase their mainframe and peripherals budget (30%) is also off the pace reported in 1978, when 51.8% planned increases in this area.

But while most said they would try to follow the Administration's wage guidelines, several firms said this could cause them problems if other firms competing for the same type of workers — primarily systems analysts and programmers — did not also follow those guidelines

Thoughts on Recession

And, furthermore, most of the DPers apparently don't think the guidelines will prevent a recession during the coming year. 61.8% predicted a recession sometime in 1979, with only 23.5% predicting no recession and 14.7% having no opinion.

However, almost 80% of the users predicted that if a recession does develop, it will not affect their departments' spending, primarily because budgeted funds have already been appropriated for the year. Other respondents said that in the event of a recession, they would economize by cutting staff either through layoffs or through a reduction in planned hiring.

Although salary increases planned for 1979 are lower than in past years, labor costs still remain the most significant part of DP budgets, according to the users.

After labor costs, expenditures for mainframes and peripherals ranked as the second and third highest budget items; supplies were ranked fourth and communications costs fifth. However, few of the users surveyed had broken down their DP spending by the various categories so there was not enough data to determine percentages

(Continued on Page 6)

With Four Systems

Prime Joins 32-Bit Mini Makers

By CW Staff Writers

WELLESLEY HILLS, Mass. — With the introduction today of four minicomputers, Prime Computer, Inc. entered the 32-bit processor arena, expanded its communications network capabilities and enhanced its software support.

The Prime 450, 550, 650 and 750 use cache memory and the company's Primos operating system with virtual storage capabilities. A networking capability for the minis called Primenet, available with CCITT X.25 support, offers support for packet-switched networks and different vendors' terminals.

The minicomputer series is reportedly upward-compatible at the object code level with earlier Prime systems.

The software announced by Prime includes PL/I and Fortran 77 compilers, a source-level debugger and an interactive data management facility called Prime/Power that is said to ease query, reporting and file maintenance tasks for "casual systems users."

VAX-Comparable Unit

The top-of-the-line 750, which Prime officials compared with the Digital Equipment Corp. VAX-11/780 in terms of performance, can support a maximum of 8M bytes of MOS memory. The 650, 550 and 450 can be equipped with a maximum of 4M, 2M and 1M bytes of memory, respectively.

The minimum amount of memory on the three smaller systems is 256K bytes, while the 750 comes with a minimum 512K bytes. Memory is available in increments of 256K, 512K and 1M bytes

The Prime 750 is a multiuser, multilanguage system with a 16K-byte cache buffer. It has a prefetch unit that handles the next four instructions after the one currently executing.

Up to 63 users, each with a virtual address space of 32M bytes, can be accommodated simultaneously by the Prime 750. Prices on this system will range from $180,000 to $300,000, depending on configuration, and deliveries will begin this summer, the officials stated.

The 650 is said to have approximately 80% of the performance of the 750. A Prime spokesman claimed the

(Continued on Page 8)

IN DEPTH
IN DEPTH

Software for sale is the best bargain in town, Werner L. Frank believes. He tells why in "The New Software Economics," a four-part series that begins this week.

FTC Tightening Screws On DP Vocational Schools

By Tim Scannell
CW Staff

WASHINGTON, D.C. — Citing numerous consumer complaints and widespread abuses and frauds, the Federal Trade Commission (FTC) has voted to enact strict rules on the business activities of close to 10,000 vocational schools across the nation — including those that offer programmer training and other DP-related courses.

The proposed restrictions — described by FTC officials as being "prophylactic," or protective, in nature — would allow students to receive a pro rata refund if they drop out of a vocational institution and would establish a 14-day "cooling off" period during which a student could decide whether to remain in a particular school.

Scheduled to take effect on Jan. 1, 1980, the regulations also require that each school release job placement and graduate salary statistics to present or prospective students to back up recruiting claims of potentially successful careers and abundant job opportunities, according to FTC staff attorney Ed Moran.

In part, the FTC's restrictive actions seek to prevent vocational schools from recruiting students on the basis

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Second-class postage paid at Boston, Mass., and additional mailing offices PN127420. Published weekly (except a single combined issue for the last week in December and the first week in January) by CW Communications/Inc. Copyright 1979 by CW Communications/Inc. All rights reserved. ISSN 0010-4841. Reproduction of material appearing in *Computerworld* is forbidden without written permission. Send all requests to Marion Kibbee.

$1.00 a copy. U.S. – $25 a year. Canada, Central & So. America – $35 a year. Europe and Near East – $75 a year; other foreign – $125 a year (airmail service). Four weeks notice is required for change of address. Please allow six weeks for new subscription service to begin.

Computerworld can be purchased on 35 mm microform through University Microfilm Int. Periodical Entry Dept., 300 Zeeb Rd. Ann Arbor, Mich. 48106 Phone (313) 761-4700. *Computerworld* is indexed; write to Circulation Dept. for subscription information.

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Canadian Precedent Set

Students Guilty of Services Theft

By Brad Schultz
CW Staff

EDMONTON, Alta. — A Canadian federal court justice here has set a precedent in this nation's jurisprudence system by finding two former college students guilty of violating Canada's law against theft of telecommunications services for surreptitiously accessing a University of Alberta computer. A third ex-student was acquitted.

Some Canadian law experts had predicted acquittals for all three — 19-year-old Bruce Christensen, 20-year-old Michael McLaughlin and 22-year-old Arnold Astels — after they were charged early last year with violating sections 287 and 387 of the Canadian federal criminal code.

Section 287 (telecommunications theft) was written to deter telephone billing evasion rather than computer abuse, the experts observed, while Section 387 ("mischief") concerns property destruction or prevention of the use of property — similar to U.S. laws against vandalism [CW, June 26].

Despite the optimistic predictions, only Astels was acquitted, while Christensen was convicted on both counts and McLaughlin on Section 287 alone.

'Played' With System?

The Crown prosecutor asserted that during the summer of 1977 the defendants bypassed the defense mechanisms of the university's Amdahl Corp. 470V/6 computer system and used CRT terminals — linked to the system over telephone lines — to establish unauthorized accounts for themselves.

According to Prof. Anthony Marsland, of the university's computer science department, however, the three simply "played" with the system. No evidence was reportedly introduced during the trial that they were motivated by monetary profit nor could the students' grade transcripts — a common target of university computer abuse — have been accessed, since they are stored at a separate facility.

Intrusion techniques were common knowledge to a number of the university's students; some were even developed as faculty-approved projects, Marsland noted. Such projects help the students understand certain concepts of computer architecture and data base technology, he explained.

The students were charged in the fall of 1977 and finally tried early last month. This is the first prosecution of computer crime on such grounds in Canadian history, according to Daniel Hagg, the attorney for McLaughlin and Astels. He pointed out that there is no Crown law against computer crime except in the area of privacy violations.

The maximum penalty for Section 287 is 10 years imprisonment. However, Christensen and McLaughlin may simply face periods of probation or outright suspensions of penalty, Hagg said.

Under Canadian law, appeal motions cannot be considered until after sentences have been set, he added.

Williams Gets Eight Years For $240,000 Welfare Fraud

LOS ANGELES — Barbara Jean Williams has been sentenced to eight years in prison after being convicted last month of swindling the Los Angeles County welfare department out of $240,000 over a seven-year period.

The mother of four used 10 different names to collect welfare payments for more than 70 nonexistent children in what is considered to be the largest welfare fraud in U.S. history. A duplication error discovered during a computerized match of welfare records led to her arrest [CW, June 18].

Williams was convicted of 10 counts of welfare fraud and 12 counts of perjury [CW, Dec. 11]. Once the length of sentence had been determined, she immediately began serving her sentence at the state prison for women at Frontera.

Los Angeles County, in an attempt to recover as much money as possible from her property, obtained an injunction forbidding Williams or her husband from selling their $170,000 home or their three cars, including a Cadillac.

The home and automobiles were allegedly bought with the welfare payments.

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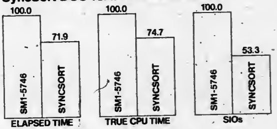

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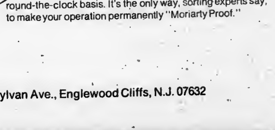

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Former Students Indicted for Altering Grades

By Marguerile Zientara
CW Staff

JAMAICA, N.Y. — Two former Queens College students — one who had Been employed at the school's DP center — were indicted last month on charges of falsifying a total of 154 grades in the computerized records of 19 different students. The alterations allegedly took place from 1974 to 1977, with some students reportedly paying hundreds of dollars for the revised grades [CW, March 20].

James Chin, 35, and Tom Tang, 26, voluntarily surrendered to New York police on the day the indictments were announced. At their arraignment later that day, both Chin and Tang plead not guilty.

Both were freed without bail since neither had any prior arrests and since they had voluntarily surrendered. The hearing was adjourned to Jan. 15, when a trial date may be set, according to a spokeswoman for the district attorney's office.

Queens District Attorney J. Santucci said the indictments of Chin and Tang resulted from an investigation begun last spring by his office's Rackets Bureau and his detective squad, with the assistance of the city Department of Investigation, the Board of Higher Education's Office of General Counsel and the administration of Queens College.

Chin, formerly Queens College's senior computer operator, is employed by Printronics Corp. of America in New York. He was indicted on one count of falsifying business records, first degree; one count of bribe receiving, second degree; two counts of receiving a reward for official misconduct, second degree; and one count of violating a state education law section dealing with unlawful acts in respect to examinations.

Tang, a salesman for Burroughs Corp. in Warrendale Heights, Ohio, was not employed at the college during the period of his alleged crime, but was a student. He has been indicted on one count of falsifying business records, first degree.

The Chin indictment charges him with 131 grade falsifications on the compoter records of 15 students, including himself, and with receiving approximately $300 from one student for whom he falsified 22 grades and $100 from another for whom he falsified 11 grades.

The Tang indictment charges him with arranging for the falsification of 23 grades on the computer records of four students, including himself. Tang did not accept money for his part in the falsifications, according to the spokesman for the district attorney's office, and the 23 grade changes he is charged with arranging are separate from the 131 grade changes allegedly made by Chin. If convicted, Chin could receive a sentence of up to seven years in jail and Tang could get a four-year sentence.

Chin was hired to work in the college DP center in 1969 and matriculated at the college in the fall of 1972. He graduated in the fall of 1975 as a Dean's List student and recipient of a Phi Beta Kappa key. Santucci noted that among the alleged grade falsifications charged to Chin, 13 were on his own record.

Tang's academic career at Queens College began in the fall of 1970 and he graduated in the fall of 1974. Santucci said three of the grade changes Tang is charged with arranging were on his own record.

Discovered Last January

The apparent falsifications came to light in January 1978, when a physics instructor at Queens College noted a discrepancy between his handwritten record of marks and the printout sheet of marks in the Physics Department.

After an internal audit of student grades, the case was turned over to the city's Department of Investigation and then to the district attorney's office. The district attorney's investigation involved an audit of hundreds of thousands of student grade cards and "seemingly miles of printout sheets," according to the spokesman.

That investigation narrowed the focus of the case to 179 discrepancies on the records of 24 students. From these, 154 grade changes on the records of 19 students were included in the indictments.

Santucci said most of the alleged tamperings involved changing data stored on computer disks, but some may have involved altering grade cards fed into the computer. Most of the alleged changes involved recording letter grades ranging from A-plus to B-minus for courses in which students had been marked as "withdrawn without permission," which is equivalent to failure, he added.

Queens College has corrected the student records involved and revoked nine degrees. Four current students are now facing school disciplinary committees, according to James O'Hara, executive director of administration at the school.

Chin's Phi Beta Kappa key was revoked when the Queens chapter found out about the investigation, according to a spokesman for Phi Beta Kappa headquarters in Washington, D.C. No other students involved in the affair had been given the scholastic honor.

The school has since tightened its DP security measures but as a matter of policy will not describe the measures. "We don't want to breach security in describing the changes, but I will say our entire grading procedure has been revised," O'Hara stated.

First Supermarket Banking in Northeast

Stop & Shop Now Offering EFT Service

By Ronald A. Frank
CW Staff

BOSTON — Customers in two local supermarkets owned by the Stop & Shop Companies, Inc. can now perform total bank transactions with an electronic funds transfer (EFT) service introduced here recently.

Described as the first EFT supermarket service in the Northeast, it allows customers to make bank withdrawals and deposits at banking terminals installed by Stop & Shup in its nearby Watertown and Somerville supermarkets. These EFT facilities are available in the stores through an agreement with Freedom Federal Savings & Loan Associatinn. Customers with statement savings or NOW accounts can transact normal bank business using the terminals.

Each store is equipped with an NCR Corp. 279 banking terminal, which is operated by a store employee. A customer wishing to make use of the banking service must have a Prestige Plus bank card issued by Freedom Federal.

When a customer presents the bank card, it is run through the terminal's magnetic stripe reader by the store operator. The customer then enters his personal identification number (PIN) on a separate keypad.

After the system has validated the customer information, deposits or withdrawals can be made in the usual manner.

The NCR 279 terminals operate online at 1,200 bit/sec over private phone lines to a Varian Data Machines V70/620 at Value Exchange Corp. in Quincy, Mass. The minicomputer acts as a network switch and routes the EFT data to a DP center at State Street Bank and Trust Co. here, where Freedom Federal customer records are processed on an IBM 370/145.

Value Exchange provides the EFT network on a turnkey basis to Stop & Shup and Freedom Federal, according to Tony Guerra, operations manager. The company provided all hardware and software support for the application, he said.

While supermarket banking has been prevalent in the Midwest and the West for some time, the Stop & Shop service marks the introduction of electronic supermarket banking to Northeast, according to a spokesman for the supermarket chain.

The bank terminals are allowed in the supermarkets because of a recent ruling from the Federal Home Loan Bank Board (FHLBB), which regulates savings and loan institutions, that this type of operation is not branch banking. The in-store banking service will be expanded as soon as customer acceptance levels are measured.

Asked whether consideration had been given to installing automated teller machines (ATM) in the supermarkets, the Stup & Shop source said Freedom Federal had applied only to install manned terminals. "We think that people are important to the transaction and the possibility of opening an account. The ATMs are passive, not a sales instrument," he said.

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Snake Has All the Lines

Animated Jungle Scene Wins Rose Parade Prize

By Marguerite Zientara
CW Staff

PASADENA, Calif. — Have things gone a little too far when a computer gets involved in a tug-of-war with an ape, four tigers and a 50-foot snake? Not according to California Polytechnic University (Cal Poly), whose computerized entry in the Tournament of Roses Parade on Jan. 1 won the Princess Award for the best use of animation.

"Cub o' War," Cal Poly's 31st annual entry, featured a jungle tug-of-war between the four tiger cubs and the 16-foot ape. Besides serving as the tugrope, the snake carried electronic lines connecting the computer with the sensory devices and electric motors in the animals. The computer equipment was located on the rear platform where the ape stood, while the cubs sat on the front platform, or drive portion, of the float.

Controlling the float's animation were a Rockwell International, Inc. System 65 microcomputer with 64K bytes of memory, a Soroc Technology, Inc. CRT and two Pertec Computer Corp. microfloppy disk drives, each with a 92K-byte capacity.

All of the equipment, valued at approximately $50,000, was donated to Cal-Poly by the manufacturers.

Programming Movements

"We wrote a program to turn off and on solenoids that control the hydraulic cylinders, telling them what direction to go in and thus controlling the figures' movements," Dale Wong, assistant electronics manager for the float, explained.

There were 36 channels of animation to control, with two channels for each of the 16 cylinders. In addition, various electric motors were triggered off by certain parts of the program, Wong said.

One main software program controlled the float, with a subprogram for each movement, according to Wong. There were about 70 separate movements, but some were mechanical — in other words, one movement would trigger another movement, he explained.

Slight Problem

While the computer and its backup worked "perfectly," according to Wong, the float ran into a slight problem just as it reached national television cameras: it abruptly stopped.

The problem was caused by a malfunction of the governor on the truck engine's carburetor and was fixed in a few minutes. "While we won the prize for best animation, we failed to accomplish our set goal — to finish the parade intact," Wong lamented.

Always an innovator in parade technology, Cal Poly's animation system has evolved from hydraulic tractor-lever controls to what it is today. Most floats make use of mechanical animation equipment, using switches controlled by a human operator, a Cal Poly spokesman said.

Donations Make it Possible

Cal Poly has won 14 major banner awards at the Rose Parade, 11 of which were received in the past 13 years. "The reason we can enter floats each year is because we receive heavy donations, ranging from the computer to flower seeds," according to Rick Reagan, electronics chairman for the project. "Without these donations, we couldn't afford a float.

"The float is a rare example of students taking classroom teaching and applying it to a real-world environment," he noted. "It is not uncommon to overhear students comment that they have learned as much or more working on the float as they did in the classroom."

The float committee was made up of 20 students from Cal Poly campuses located in Pomona and San Luis Obispo.

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Pay Raise Lid May Hold Budget Hikes to 8.4%

(Continued from Page 1)

of each as a portion of the overall budget.

Users clearly rated salaries as the most inflationary item in their budgets this past year, with 64.7% citing employee pay as the element that had risen the most. Second came supplies mentioned by 44.1% of the users as an inflationary budget area largely because of increasing paper costs. Maintenance was the third most mentioned inflationary item, with 14.7% of the mentions. The total is more than 100% because several users rated several factors as inflationary.

Hiring Plans

In spite of the recessionary predictions, however, users plan new hires during the year — although at a reduced rate from 1978.

Overall, 52.9% planned to add personnel compared with 70% who had such plans last year at this time. And the number of new hires was also significantly lower, typically ranging between three and five new employees, compared with last year's eight or nine on an average.

Most of the new hires are planned for the first quarter of this year, the respondents said, and most fall in the programmer or systems analyst category.

In the area of spending for systems equipment — mainframes and peripherals — 63% expect to spend the same amount as last year, 30% plan increases in expenditures and 7% expect lower expenditures during the year.

However, the average increase among those planning boosts in equipment expenditures will be a whopping 27.5% during the coming year.

Although distributed processing has been a much discussed subject, relatively few of the users surveyed used minicomputers for distributed DP. Fifty-six percent of the companies had no minis, while 44% indicated they used minis for data collection, process control, general business applications, data entry or instruction. Of those 15 firms using minis, six billed user departments for them, six payed for the equipment from their own DP budgets and three noted they acquired mini equipment through both departments.

Most respondeots indicated that their budgets for minicomputers would remain about the same as last year.

Data Entry Costs

In other survey areas, the majority of respondents (58.8%) revealed that the cost of data entry was included in the DP budget. Those companies that either charged such costs to the user departments or split costs between the users and DP departments were even at 20.5% each. A total of 52.9% of the respondents revealed that they did not bill users for data entry, while only 23.5% billed the user departments.

The greatest number of respondents foresaw their data entry budgets remaining stable, with 41.2% staying the same as the year before, and 17.6% of the respondents reporting data entry budget increases ranging from 2% to 70%. The latter figure resulted from the installation of an entirely new communications network. Meanwhile, 14.7% of the companies said their data entry budgets would decrease from 10% to 40% and others were not sure.

The largest variations in budget changes appeared in the areas of outside software and communications; where the figures varied by hundreds of percentage points.

A total of 41.1% of the respondents reported increases in their software budgets ranging from 3% to 93%, while 26.4% indicated their software spending would remain even with last year's budget tally. Others were unsure of their costs and one respondent reported a decrease in software costs.

In communications allotments, 47% of the respondents will increase their communications budgets this year from 3% to as much as 500%. The one 500% increase cited was attributed to the installation of terminals and lines at remote locations.

While 8.8% of those surveyed noted that their communications budgets would remain the same as in 1978, 5.9% reported their budgets would decrease. Others did not know the amounts of increase or decrease.

Other Worries

Departing from budget concerns, respondents mentioned other worries for the coming year, and most were personnel-related.

Almost all of the respondents mentioned that keeping people from "job jumping" would be a major problem, especially if some firms observe the 7% pay increase ceiling, and others disregard it, offering more appealing raises and salaries.

Other concerns mentioned were productivity and efficiency, cost control, installation and upgrades of new systems and meeting deadlines.

The CW budget and trends survey was based on interviews with DP personnel from a random selection of manufacturing, service, educational, government, insurance and retail organizations. Most were IBM systems users and ranged from nonprofit agencies to firms with $600 million in revenues.

Annual DP budgets ranged from $288,000 to $9 million among those surveyed.

The Computerworld *annual budget survey was conducted this year by staff writers Ann Dooley, Marcy Rosenberg and Marguerite Zientara.*

Machine Models Funded by NSF

ROCHESTER, N.Y. — The National Science Foundation (NSF) has awarded the University of Rochester's Production Automation Project research group a $371,200 grant to continue its study of the mathematical modeling of machining processes.

The project was established in 1972 under the guidance of Herbert Voelcker, a professor of electrical engineering. The group performs research in collaboration with industry and government agencies into the theories and technologies of mechanical manufacturing, design and assembly.

The research is based upon the use of the Part and Assembly Descriptive Language (PADL), developed by the Rochester-based scientists to facilitate the three-dimensional modeling of machine parts, assemblies and tools, a spokesman said. The software language reportedly gives a precise description of certain kinds of mechanical parts by describing them as constructions of simple blocks and cylinders. It then automatically produces three-dimensional engineering drawings and geometric models of the described parts.

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Tops on the 'Most Wanted' List

Employers Hungriest for Computer Specialists

By Marcy Rosenberg
CW Staff

PHILADELPHIA — The U.S. job market beckons for computer specialists, who are expected to surpass engineers as the nation's most sought-after professionals this year.

Whether or not a recession hits in 1979, U.S. employers will still hunger for professional workers in most disciplines, with the most ravenous appetites in the DP area, according to an unpublished report by Fox-Morris Personnel Consultants here.

The national demand for DP professionals will climb at least 15.1% over 1978 and is projected to jump another 15% in 1980, according to Warren Nuessle, Fox-Morris vice-president. The increase from 1977 to 1978 was between 10% and 11%, he said.

Because the demand for professionals exceeds the supply in many fields, employers in practically every U.S. market are prepared to offer 9.75% higher average earnings packages this year, Fox-Morris found in its survey of at least 17,000 client companies across the country, most with small, medium or large DP operations.

No Exception

The DP community appears to be no exception, according to survey results. For example, responding companies indicated they would pay management information systems (MIS) directors with 15 years of experience about 8.5% to 9% more than in 1978.

Findings showed this category of professionals will earn an average national salary of $37,300 and are expected to draw an average top salary of $45,000.

Systems programmers at the two- to five-year experience level can expect to make between 12% and 13% more than they did last year, according to Nuessle. Employers said they would hire these individuals at an average salary of $22,100; the average high anticipated was $24,400.

At the middle management level, the going rate in 1979 for DP managers will be between $25,000 and $35,000, Nuessle forecast.

Carter Ceiling Too Low

While virtually all firms responding to the survey said they supported President Carter's inflation-fighting efforts, most indicated they could not effectively apply the 7% ceiling on wage increases and still hold on to — or compete for — professional employees.

"Company personnel executives are faced with the reality that the top talent goes to the top bidder," Fox-Morris pointed out. "They also know they have to be able to attract — and keep — a rather scarce supply of top talent that they feel will look for greener pastures" if work efforts are not rewarded.

Heading the "most wanted" list of computer specialists are programmers — in applications, systems and software — followed by systems analysts, telecommunications specialists, middle management and DP executives.

Companies plan to hire about 15.1% more programmers and systems analysts in 1979 than last year, in line with the average increased demand for all computer specialists. The reason is that as in most fields, "the worker bee is in much greater demand than the queen," if only because of sheer numbers, Nuessle explained. "There are probably five programmers for each manager."

From 1977 to 1978, the demand for programmers and analysts increased about 12%, he estimated.

Managers and Executives

DP and other middle managers will be 10% to 11% more in demand this year than last and the demand for DP executives will go up about 8% to 9%, according tu Nuessle, who added these figures show a percent increase similar tu the 1977-1978 period.

Even if 1979 brings an economic downturn, computer specialists will be more in demand than in 1978 and more in demand than any other professionals because DP personnel needs are more a function of technology advances than of growth in the economy, Nuessle said.

Changes in computer technology are rapid and frequent and "there is no end to the need for good people," he emphasized. "IBM comes out with new systems almost every two years. More specialized people are needed to work with the more sophisticated, up-to-date DP systems."

Employers, Nuessle added, are looking for people with strong analytical, math and statistics backgrounds. "Most DP companies rely heavily on testing, and a good foundation in calculus helps."

General Experience Urged

The demand is greater fur people with some experience, Nuessle said, but he does not recommend that anyone specialize in any particular area of DP before gaining one ur two years of experience in the field.

Companies no longer bring in "droves of college grads to train in DP, because they have no time to train them," Nuessle noted. "They need the work done yesterday."

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Prime Joins Ranks of 32-Bit Mini Makers

(Continued from Page 1)

system is "ideally suited" for distributed DP applications, that off-load batch-oriented mainframes.

In addition, "users of the 650 can expect instruction execution times for single- and double-precision floating-point arithmetic to be comparable to those of the IBM 370/158," he said.

Like the 750, the 650 can accommodate up to 63 users with a virtual address space of 32M bytes each. However, it has a smaller cache memory — only 2K bytes — as well as a smaller price, $150,000 to $250,000, depending on configuration. Deliveries of this system are slated to begin immediately.

The Prime 550 was described as a "logical first step" for the user who wants an inexpensive solution immediately, as well as the ability to upgrade to a more powerful system. Prime compared the system's abilities to those of the DEC Decsystem 2020 and the Data General Corp. Eclipse M-600, but said the 550 is less expensive than those systems.

With a 2K-byte cache memory, business instruction set, 128 32-bit registers and the virtual control panel used in the other three systems, the 550 will sell for $95,000 to $175,000, depending on options and features. Deliveries are scheduled to begin immediately.

The smallest system, the 450, is aimed at "system builders" and includes the 2K-byte cache memory and a 32M-byte cartridge disk which was introduced at the same time by the company. If ordered in quantities of 50 to 60 units, the 450 can be bought for as low as $35,000 per system beginning in April, the spokesman said.

Support for 3277

As part of its Distributed Processing Terminal Executive (DPTX) software, Prime introduced support that allows IBM 3277 CRT subsystem users to interchange application programs with either the latest Prime or IBM 370 and Series 30 CPUs.

The teleprocessing software transparency between Prime and IBM is limited to a Binary Synchronous Communications mode and does not include 3277s running under Synchronous Data Link Control in Systems Network Architecture configurations, the Prime spokesman noted.

CRT users with IBM or Prime subsystems can reach programs on both types of mainframes with the Prime processors, said to augment computational power at local sites while DPTX off-loads the IBM host for more efficient use of central site resources.

DPTX handles all communications processing between an IBM host and Prime systems and is compatible with most major IBM teleprocessing access methods plus IMS/VS, CICS/VS and TSO, Prime said.

Compilers and Debugger

Both the Fortran and PL/I compilers were designed to comply with current American National Standards Institute specifications for the respective languages, according to the spokesman. They enhance the choice of languages available to the Prime user, which already includes ANS Cobol 74, Basic, Basic/VM, IBM-compatible RPG-II and a macro-level assembler, he said.

The interactive source-level debugging tool can be used with any high-level language. While it would generally be used at the source level, users can jump down into the machine-level code whenever they wish, the spokesman emphasized.

Prime/Power works in conjunction with the company's data base management system. It isolates the user from the system and simplifies data definition and manipulation; it allows "casual" users to modify, compute, create, inquire about and report information from Prime file systems.

An enhanced version, Prime/Power Plus, is said to add support for more sophisticated users, including both dynamic and static file linking, text and table processing and more powerful format controls than those available with the basic Prime/Power.

Available under licenses, the software ranges from $1,500 for the source level debugger to $4,500 for ANS Fortran 77 and $5,000 for the initial PL/I subset scheduled for June delivery. Prime/Power costs $7,500 while Prime/Power Plus carries a $12,500 tag.

Networking Capability

The Primenet networking capability was described as a layered architectural design that can support a variety of communications protocols without disturbing the existing user environment.

For local nets, the company is offering the Primenet node controller; for synchronous high-speed communications, the Multiple Data Link Controller (MDLC) is available.

A standard version of Primenet without X.25 compatibility costs $5,000 while a full packet net implementation costs $7,000. The DPTX data stream compatibility feature for multidrop 3277 networks costs $5,000.

The terminal support capability costs $6,000. The full DPTX transparent connect facility, which includes data stream and terminal support, is priced at $12,000.

The node controller costs $4,000 and the MDLC hardware costs $5,000 with the desired user protocol option.

Prime is located at 40 Walnut St., Wellesley Hills, Mass. 02181.

FTC Curbing DP Schools

(Continued from Page 1)

of their eligibility for federal financial aid programs and assistance, Moran stated.

According to U.S. Office of Education figures, the federal government paid $543,211,000 for educational loan guarantees in fiscal 1976. Of that amount, 23%, or $83 million, went toward vocational education.

However, even though vocational institutions absorb about one-fifth of the government's educational money, those same schools account for 56% of the student defaults.

The reason for that proportionately high default rate is that many schools paint an attractive picture of what their particular institution has to offer. Once the students are actually attending classes, many find out the courses don't deliver what was promised by the recruiter and subsequently drop out, Moran explained. Usually the unsatisfied student already has signed a contract agreeing to pay most or all of the tuition and therefore must forfeit the money to the school.

The rules will also protect the student who uses his own money to pay for tuition or educational materials, Moran said.

"The structure of [vocational] schools basically is not to get the best student to come into the school," but simply to fill classroom space and attract funding, the FTC attorney stated. We believe these particular rules will provide more protection for the student."

Shifting the Burden

A number of vocational education experts and industry spokesmen disagree with the FTC's opinions and believe the proposed rules will shift the burden of paying for each school's operation to the entire student body by pumping up tuition costs.

The only funds an institution gets are from tuition . . . and the student who completes the course is being forced to bear an unfair portion of the entire cost," according to Bernard Ehrlich, an official of the Washington, D.C.-based National Association of Trade and Technical Schools (Nats). The association is one of two agencies — the Association of Independent Colleges and Schools (AICS) is the other — that must provide accreditation before a school can be eligible to accept Guaranteed Student Loans (GSL), Basic Education Opportunity Grants (BEOG) and other federally funded programs.

Ehrlich claimed that instituting a pro rata refund policy and two-week free-trial education offers would result in vocational tuition increases.

Vocational schools have certain expenses and bills to pay "and if a student drops out, you can't drop an instructor to make up for the tuition loss," Ehrlich stated. Raising tuition for the entire student body is the only way of "recouping the costs."

AICS feels "this whole solution is unfair to the students — particularly those who come to schools, do a legitimate job to work hard in the institution and graduate," according to Ehrlich.

Suit Filed

The FTC has given the schools 60 days — beginning last Dec. 28 — to appeal the proposed regulations, and since that time several vocational organizations have filed suit against the commission's actions in the second Circuit of the U.S. Court of Appeals. Computer Processing Institute (CPI), a 13-year-old Connecticut-based school, has been asked by the AICS to participate legally against the FTC's proposals and is the flagship for other vocational Institutions wishing to take similar action, CPI President David Shefrin pointed out.

"We object to the proposed regulations because we believe the FTC doesn't have any standing in interfering with a third-party contract," Shefrin said. "It is in effect telling schools how they should write their contracts."

Shefrin noted that CPI is already doing most of the things stipulated by the FTC proposals and that the school — claiming a graduate placement rate of 91% — exceeds most of the standards set by the U.S. Office of Education in order to comply with U.S. Department of Health, Education and Welfare (HEW) guidelines.

Moran pointed out that the rulings are actually a watered down verion of the regulations that were considered by the commission approximately 18 months ago. The older version contained a "reaffirmation policy" requiring the schools to send a letter to a student after he signed up for a course and the student to return a letter restating his educational intentions.

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Public Comments Due by Jan. 10

Post Office Part in Electronic Mail Under Study

By Jake Kirchner
CW Washington Bureau

WASHINGTON, D.C. — The Carter Administration has initiated a study of U.S. Postal Service involvement in electronic mail.

The project, announced here last month, will enable the Administration to develop a position on electronic communications policy in the postal area, according to the National Telecommunications and Information Administration (NTIA), which is acting as the "lead agency" for the project.

The study will involve a 10-agency "coordinating committee" headed by Stuart E. Eizenstat, assistant to the President for domestic affairs and policy. It will include representatives of the Justice, Treasury, Labor and Agriculture departments, the Office of Management and Budget, the National Aeronautics and Space Administration, the Council of Economic Advisors and the Council on Wage and Price Stability.

The committee hopes to develop some policy recommendations for the President by spring, when Congress is expected to take up the issue, according to John J. Parla, a member of the NTIA staff working on the project.

Seeks Comments

NTIA's responsibility in the study is "to act as the lead agency for the federal government in considering the various aspects of what occurs in the emerging world of electronic-type mail," Parla said. To that end, the agency "is seeking public comments "on the impact of electronic mail in the future and how this new world of electronic mail should be introduced."

The goal is "to make sure we have input as soon as possible from every source that feels it has a valid interest before we take action in the area of national policy," Parla explained. The study has a very high priority at NTIA and will make a "thorough examination of the Postal Service and its role in electronic mail," he added.

Written comments from "interested individuals and organizations in either the private or public sector" will be accepted through Jan. 10, NTIA said. "The short time period is called for to allow the committee to take the comments into account" and make recommendations by "early spring when, it is believed, Congress will be considering the issue," the agency noted.

Three Considerations

Because of the short time frame of the study, NTIA said it will have a "limited range of inquiry." Comments should address three specific policy considerations:

- The possible future benefits to the nation of Postal Service involvement in electronic message services and the potential cost to the nation of establishing Postal Service competition in an industry that has been restricted to private competition.
- The impact of electronic communications on Postal operations and revenues (both with and without Postal Service Electronic Services) and the overall economic impact, including potential reduction in postal costs, of a Postal Service investment in an electronic system.
- The options for interconnection between the Postal Service's physical delivery network and the electronic message industry.

The NTIA announcement asked for 20 copies of any comments filed. They should be sent to Samuel Williams, Office of Planning and Policy Coordination, NTIA, 1800 G. St. N.W., Washington, D.C. 20504.

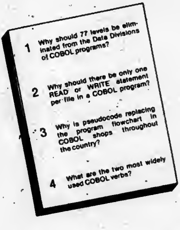
Human Choice, DP to Be Topic

VIENNA, Austria — The International Federation for Information Processing (Ifip) will hold its second conference on Human Choice and Computers here June 4-8.

The conference will deal with the impact of computerization on society. It is based on the results of the first Human Choice and Computers conference held here in April 1974.

Fourteen invited speakers will explore "Computers and Society" as an emerging discipline as well as other cultural issues, a spokesman said.

Information on registration and conference details is available from Fred Margulies, Ifip Conference, Human Choice and Computers, Austrian Organizing Committee, P.O. Box 179, A-1013, Vienna, Austria.



1 Why should 77 levels be eliminated from the Data Divisions of COBOL programs?

2 Why should there be only one READ or WRITE statement per file in a COBOL program?

3 Why is pseudocode replacing the program flowchart in COBOL shops throughout the country?

4 What are the two most widely used COBOL verbs?

A test for COBOL programmers (and their managers)

The answers

1. Recent thinking on productivity says you shouldn't use 77 levels because they don't show relationships. Instead, you should group related items in working storage. This will make it easier for you to locate them during coding and testing.

2. Because a READ or WRITE function will often have subfunctions associated with it, it should be coded in its own module (paragraph) along with the subfunctions. Then, the module can be performed from other paragraphs of the program and you take no chance of omitting the subfunctions. In the long run, this will simplify coding, testing, and maintenance.

3. Because program flowcharts are difficult to create and maintain, they have never been an efficient tool for design or documentation. But for years no one came up with anything better. Now, there are several alternatives, one of which is pseudocode, that threaten to make the flowchart obsolete.

4. The MOVE and GOTO verbs. Although there's nothing wrong with those MOVEs, the GOTOs are a serious problem. Briefly stated, the more GOTOs a program has, the more difficult it is to code, test, and maintain. The modern goal is to code programs without any GOTOs so the Procedure Divisions can be read from the first page to the last without any page flipping. The trick, of course, is to find a way to design programs that makes it easy to code without using GOTOs.

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Test evaluation

If you're still using 77 levels and you don't care whether there's more than one READ or WRITE statement per file, you could do worse. While these changes should become part of your programming standards, they won't make or break you.

On the other hand, if you're still using flowcharts and the GOTO is one of your most widely used statements, I'd like to show you an exciting, new way to design, document, code and test COBOL programs. This method can enrich jobs and improve programmer morale. And it can help you get your projects done on time and within budget.

A better way to develop programs

Paul Noll is a software specialist and training manager for a large company in San Francisco. And he is one of the top COBOL experts in the country. After experimenting with productivity techniques for several years, he decided that no one had developed a practical way to implement them. So he developed his own methods.

His methods are now presented in two books designed for the experienced COBOL programmer. The first book, called *Structured Programming for the COBOL Programmer*, presents a complete system for developing COBOL programs that includes top-down design, structured coding, and top down testing. To use Paul's methods, you won't have to learn a new vocabulary and you won't be overwhelmed by theory. As one customer commented: "Until I read Paul's book, I had always regarded structured programming as something that was nice in theory, but impractical to implement."

The second book, *The Structured Programming Cookbook*, is a tool kit for the development of new programs. It gives standards and guidelines for program development along with complete design, documentation, and code for four programs that represent the four major classes of business problems. As another customer commented: "This book has stopped the re-invention of programs in our shop."

If you have yet to be introduced to the new productivity techniques, Paul's books may be the best investment you'll make this year. And they are the only books or course you will ever need if you decide to implement the new techniques in your shop. If, on the other hand, you have experimented with the new techniques but you aren't satisfied with the results, please review these books. In my opinion, Paul's books will help you turn theory into practice.

S-6

Mike Murach & Associates, Inc.,
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Dear Mike: Please send me the books I've indicated so I can evaluate Paul's methods for myself. If I don't discover an exciting, new way to develop COBOL programs, I'll return the books for a full refund. I understand I will be billed the appropriate price plus freight (plus sales tax in California).

Quantity	Book	Price	
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________	The Structured Programming Cookbook	$10.00	

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IBM and the compatibles: how they measure up

By Marcy Rosenberg
And E. Drake Lundell Jr.
CW Staff

SYSTEM / CHARACTERISTICS	IBM 370/115-0	CAMBRIDGE MEMORIES Model 1	IBM 370/125-2	CAMBRIDGE MEMORIES Model 2	IBM 370/135-3	CAMBRIDGE MEMORIES Model 3
Relative Performance[1]	2.25	2.47*	6.3	6.9*	11.7	12.87*
Memory Size in Bytes (Minimum to Maximum)	65K-384K	256K-768K	96K-512K	512K-1M	96K-512K	512K-2M
Purchase Price[2] (Memory Size)	$110,550 (384K)	$120,000 (256K)	$216,100 (512K)	$185,000 (512K)	$460,720 (512K)	$265,000 (1M)
Monthly Lease[3] (Lease Term)	$2,880 (4 Years)	Not Available	$5,916 (4 Years)	Not Available	$11,956 (4 Years)	Not Available
Memory Cycle Time (Nsec)	480	120	320-480	120	770-935	120
Machine Cycle Time (Nsec)	480	480-1,130	480	300-950	275-1,465	180-850
Channels (Minimum to Maximum)	1	3	1	3	1-3	3-5
Cache (Buffer) Size	None	None	None	None	None	None
Bus Architecture?	No	No	No	No	No	No
Price per 1M Byte Of Main Memory	$75,000	$100,000	$75,000	$100,000	$350,400	$100,000

Figure 1

SYSTEM / CHARACTERISTICS	IBM 370/138	NANODATA VMX 200	MAGNUSON SYSTEMS M80/3	NATIONAL SEMICONDUCTOR 400	NATIONAL CSS 3200	ITEL AS/3-3	CITEL 30 Model 3	CONTROL DATA Omega 480-I
Relative Performance[1]	11.7	16*	17	16	16[5]	16	21*	21
Memory Size in Bytes (Minimum to Maximum)	512K-1M	256K-1.5M	512K-16M	256K-6M	256K-4M[6]	1M-2M	256K-16M	512K-2M
Purchase Price[2] (Memory Size)	$329,880 (1M)	$125,000 (1M)	$245,000 (1M)	$200,000[4] (1M)	$230,500[7] (1M)	$490,000 (1M)	$360,000 (1M)	$330,000 (1M)
Monthly Lease[3] (Lease Term)	$10,439 (4 Years)	Not Available	$9,500 (Monthly)	$5,266 (4 Years)	$5,363 (5 Years)	Not Available	Not Available	Not Available
Memory Cycle Time (Nsec)	715-935	525 (4 Bytes)	300	400	650	690-1,035	300	450-750
Machine Cycle Time (Nsec)	275-1,430	300	100	100	250	115	200	50
Channels (Minimum to Maximum)	3	2-5	3-16	0-12	1-8	3	5-6	3-5
Cache (Buffer) Size	None	None	None	None	None	None	None	None
Bus Architecture?	No	Yes	Yes	Yes	Yes	No	Yes	Yes
Price per 1M Byte Of Main Memory	$75,000	$52,000	$80,000	$70,000	$60,000	$110,000	$75,000	$80,000

Figure 2

SYSTEM / CHARACTERISTICS	IBM 370/148	ITEL AS/3-4	CONTROL DATA Omega 480-II	ITEL AS/4	NANODATA VMX 400	CITEL 30 Model 4	MAGNUSON SYSTEMS M80/4	ITEL AS/5-1
Relative Performance¹	24	24	28	28	32*	36*	36	41
Memory Size in Bytes (Minimum to Maximum)	1M-2M	1M-4M	1M-4M	1M-4M	512K-8M	1M-16M	1M-16M	1M-8M
Purchase Price² (Memory Size)	$562,890 (1M)	$600,000 (1M)	$370,000 (1M)	$922,000 (2M)	$220,000 (1M)	$580,000 (1M)	$395,000 (1M)	$1,155,000 (2M)
Monthly Lease³ (Lease Term)	$17,624 (4 Years)	Not Available	Not Available	Not Available	Not Available	Not Available	$18,500 (Monthly)	Not Available
Memory Cycle Time (Nsec)	405-540	890-1,035	450-750	690-1,035	495 (8 Bytes)	300	300	690-920
Machine Cycle Time (Nsec)	180-225	115	50	115	175	200	100	115
Channels (Minimum to Maximum)	6	5	5	6	3-20	12-16	5-18	6
Cache (Buffer) Size	None	2K	8K	4K	None	None	None	8K
Bus Architecture?	No	No	Yes	No	Yes	Yes	Yes	No
Price per 1M Byte Of Main Memory	$75,000	$110,000	$80,000	$110,000	$52,000	$75,000	$80,000	$110,000

Figure 3

Not since the early 1950s has the computer community seen so many entries into the mainframe arena as it did in 1978, when six firms began offering processors that are compatible with IBM software.

This activity brought to nine the number of firms now in that marketplace, creating a great deal of confusion for users about the capabilities and prices of the systems.

On these pages, *Computerworld*, in conjunction with International Data Corp. (IDC), attempts to place the new entries in perspective, listing them along with the IBM systems with which they compete.

Importance Increasing

The importance of computers which are software-compatible with IBM mainframes is increasing dramatically, not only in terms of their numbers, but also in terms of their acceptance.

At the end of 1977, 132 such systems were installed, but during 1978 that number almost tripled to 375 installations, according to IDC estimates. Their share of the total IBM 370- and Series 30-compatible base grew from 1.3% to 3.4% during the year, IDC said.

Furthermore, the software-compatible machines should account for nearly 20% of the installations of 370/148-and-above class machines by 1980, IDC added. Looking at the IBM base of 370/138s and up, the market research firm said the software-compatible manufacturers' share should grow to nearly 13% from their current 4.4% portion.

Another indication of the widening impact of the software-compatible machines can be seen in the broadening of the offerings made in 1978. Manufacturers of such systems had previously concentrated on the high end of the IBM line, offering machines comparable in power to the IBM 370/158 and above; during 1978, however, they offered systems that bracketed the entire IBM 370 and Series 30

(Continued on Page 12)

NOTES

1. Relative throughput based on the IBM 370/158-3 equalling 45. Performance is based on manufacturers' claims at time of product announcement, later adjusted as user benchmarks and experience are reported. Compiled by International Data Corp.'s Information Systems Planning Service in cooperation with Computerworld. Performance figures for systems with an asterisk (*) are based solely on manufacturers' claims.
2. For a configuration including CPU, stated main memory, power supply, console and minimum channels as supplied by manufacturers.
3. Almost all of those firms which chose not to outline their lease prices ("Not Available") said lease plans were available. However, they declined to be specific because of variables in terms and types of leases.
4. Price for a System 400 including two I/O processors (equivalent to two channels), a 200M-byte disk, magnetic tape unit and printer in a single quantity.
5. The Two Pi Corp. machine configured into a 3200 system with the VPS operating system from NCSS.
6. Can be extended to 16M bytes in OEM configurations with the addition of circuitry. As marketed to end users by NCSS, the present memory maximum is 2M bytes.
7. End-user price including the VPS operating system, a 5% software license credit, installation service and three channels as quoted by NCSS.
8. On Amdahl machines, channels come in groups of four, and the number can range from eight to 12 to 16.

SYSTEM / CHARACTERISTICS	IBM 370/158-3	ITEL AS/5-3	IBM 3031	ITEL 7031	ITEL 7031 AP	IBM 3031 AP	IBM 370/168-3
Relative Performance¹	45	45	54	54	85	90	124
Memory Size in Bytes (Minimum to Maximum)	512K-8M	1M-8M	2M-6M	1M-8M	1M-16M	2M-6M	1M-8M
Purchase Price² (Memory Size)	$1,545,365 (2M)	$1,219,000 (2M)	$1,000,000 (2M)	$1,100,000 (2M)	$1,570,000 (2M)	$1,375,000 (2M)	$3,498,350 (4M)
Monthly Lease³ (Lease Term)	$44,255 (4 Years)	Not Available	$25,000 (4 Years)	Not Available	Not Available	$37,500 (4 Years)	$96,175 (4 Years)
Memory Cycle Time (Nsec)	690-1,035	690-920	345	600-800	600-800	345	320
Machine Cycle Time (Nsec)	115	115	115	100	100	115	80
Channels (Minimum to Maximum)	0-6	6	8	6	6	8	0-12
Cache (Buffer) Size	16K	16K	32K	32K	32K	32K	32K
Bus Architecture?	No	No	No	No	No	No	No
Price per 1M Byte Of Main Memory	$75,000	$110,000	$75,000	$110,000	$110,000	$75,000	$75,000

Figure 4

(Continued from Page 11)

lines of computers.

The major cloud on the horizon for the IBM compatible mainframe makers presently appears to be the possible reactions from IBM, particularly the introduction of that firm's long-expected E series of computers.

All of the manufacturers use IBM software on their systems (except National CSS, Inc., which offers its own operating system that is compatible with the IBM operating system) and depend on IBM software that is in the public domain.

However, recent IBM product announcements have featured unbundled operating systems. This could spell trouble for the independents if IBM continues that trend when it introduces the E series of small- and medium-scale systems this year.

The E series systems are expected to be tough competitors on a straight hardware basis. If the software is unbundled, that could blunt the independent's major selling point.

Also seen as a move against its plug-compatible competition was IBM's December price cuts for Mosfet memory on most models in the 370 and 30 series [CW, Dec. 10]. Chart prices reflect the reduced system and rental prices where they apply.

It is interesting to note that IBM did not lower its prices on minimum memory for any of the 370 or 30 models otherwise affected. Therefore, the purchase price for those systems with minimum memory remain the same.

The systems are ranked in order of their "relative performance," a measure developed and refined by IDC and CW. This relative performance attempts to measure the rough throughput of the various machines.

The numbers are derived from manufacturer claims at the time of announcement of a product. Thus, if a manufacturer claimed its system is 30% more efficient than the IBM unit it replaced, the relative power rating was initially given as 30% greater than the IBM machine.

These ratings were then updated and massaged as user experience with the systems was reported in the trade press or through telephone interviews conducted regularly by IDC.

For example, based on IBM's claims on announcement day, the original rating given for the IBM 3033 was 200 on a scale similar to the one given here. However, user experience to date has indicated the system is actually a bit (10%) more efficient than the manufacturer claimed, so the machine has been upgraded to a rating of 223.

In addition, CW was fortunate this year in receiving two IBM documents that rate the IBM systems in terms of power. These documents were used to test the accuracy of the numbers; a remarkable degree of agreement was found.

SYSTEM / CHARACTERISTICS	IBM 3032	AMDAHL 470V/5	ITEL AS/6-1	ITEL AS/6-2	AMDAHL 470V/5-II	AMDAHL 470V/6	AMDAHL 470V/6-II
Relative Performance[1]	124	130	137	149	143	177	200
Memory Size in Bytes (Minimum to Maximum)	2M-6M	4M-8M	2M-18M	2M-18M	4M-8M	4M-8M	4M-8M
Purchase Price[2] (Memory Size)	$2,077,000 (4M)	2,000,000 (4M)	$1,980,000 (2M)	$2,160,000 (2M)	$2,100,000 (4M)	$2,430,000 (4M-12 Channels)	$2,530,000 (4M-12 Channels)
Monthly Lease[3] (Lease Term)	$49,980 (4 Years)	$52,000 (4 Years)	Not Available	Not Available	$54,500 (4 Years)	$66,000 (4 Years)	$68,500 (4 Years)
Memory Cycle Time (Nsec)	320	325	432	432	325	325	325
Machine Cycle Time (Nsec)	80	32.5	72	72	32.5	32.5	32.5
Channels (Minimum to Maximum)	6-12	8-16[8]	6-16	6-16	8-16	8-18	6-16
Cache (Buffer) Size	32K	18K	64K	64K	32K	18K	32K
Bus Architecture?	No	No	No	No	No	No	No
Price per 1M Byte Of Main Memory	$75,000	$85,000	$110,000	$110,000	$85,000	$85,000	$85,000

Figure 5

SYSTEM / CHARACTERISTICS	IBM 3033	AMDAHL 470V/7	AMDAHL 470V/8	IBM 3033 MP
Relative Performance[1]	223	290	360	374
Memory Size in Bytes (Minimum to Maximum)	4M-8M	4M-16M	4M-16M	4M-8M
Purchase Price[2] (Memory Size)	$3,380,000 (4M)	$3,080,000 (4M)	$3,280,000 (4M)	$7,140,000 (4M)
Monthly Lease[3] (Lease Term)	$70,400 (4 Years)	$75,000 (4 Years)	$80,000 (4 Years)	$153,460 (4 Years)
Memory Cycle Time (Nsec)	285	290	260	285
Machine Cycle Time (Nsec)	57	29	26	58
Channels (Minimum to Maximum)	12-18	12-16	12-16	24-32
Cache (Buffer) Size	64K	32K	64K	64K
Bus Architecture?	No	No	No	No
Price per 1M Byte Of Main Memory	$75,000	$85,000	$65,000	$75,000

Figure 6

NOTES

[1] Relative throughput based on the IBM 370/158-3 equalling 45. Performance is based on manufacturers' claims at time of product announcement, later adjusted as user benchmarks and experience are reported. Compiled by International Data Corp.'s Information Systems Planning Service in cooperation with Computerworld. Performance figures for systems with an asterisk (*) are based solely on manufacturers' claims.

[2] For a configuration including CPU, stated main memory, power supply, console and minimum channels as supplied by manufacturers.

[3] Almost all of those firms which chose not to outline their lease prices ("Not Available") said lease plans were available. However, they declined to be specific because of variables in terms and types of leases.

[4] Price for a System 400 including two I/O processors (equivalent to two channels), a 200M-byte disk, magnetic tape unit and printer in a single quantity.

[5] The Two Pi Corp. machine configured into a 3200 system with the VPS operating system from NCSS.

[6] Can be extended to 19M bytes in OEM configurations with the addition of circuitry. As marketed to end users by NCSS, the present memory maximum is 2M bytes.

[7] End-user price including the VPS operating system, a 5% software license credit, installation service and three channels as quoted by NCSS.

[8] On Amdahl machines, channels come in groups of four, and the number can range from eight to 12 to 16 as specified.

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Massachusetts Continues DP Tax Debate

By Marguerite Zientara
CW Staff

BOSTON — In a tame and modestly attended three-hour informal hearing before the Commonwealth of Massachusetts Department of Revenue here last month, DP industry spokesmen once again attempted to convince tax commissioners that software and services are intangible and therefore not subject to state sales and use taxes.

According to existing Massachusetts statutes regarding sales taxes, "tangible, personal property" is taxable, and the state tax commission is now trying to write regulations interpreting the statutes in the area of DP.

In announcing the meeting, the tax commission had expressed a particular interest in hearing definitions of terms such as "hardware" and "software" as well as descriptions of vendor-customer arrangements.

Robert Sherin, president of Miami-based Nova Computing Services and nonjudicial legislative advisor to the Data Processing Management Association (DPMA), made the first of two formal presentations at the meeting, which was attended by approximately 50 industry representatives.

Sherin began his argument by citing recent rulings in New York and Florida in which software was declared intangible and nontaxable, results toward which DPMA had lobbied.

Sherin, reading from DPMA's position paper on the issue, also noted the Tennessee Supreme Court's 1976 definition of "computer software" as "information and directions loaded into the machine which dictate different functions for the machine to perform.

"What triggers these functions are referred to broadly as 'programs,' and are often accompanied by magnetic tapes and disks, punch cards, manuals, flow charts and expert engineering assistance to comprise what is known as computer software," the definition said.

DPMA Position

According to DPMA, Sherin said, computer software is intangible because:

- "Said software may be entered into a computer directly or via telephone lines with no tangible personal property, with the identical result as if tangible property were used as the input communications medium."
- "Such communications media are merely intermediate input means of entering software into a computer on a one-time basis before it is transformed into its intangible end state of binary pulses."
- "Said tangible property, if any, is either destroyed or reused after being used to transfer the intangible information therein to the computer on a one-time basis, leaving instructions (program) and information (data) in the computer in the form of binary pulses as 'the intangible end state.'"
- "The value of said tangible property, if any, is small, 5% or less, in comparison to the value of said intangible software."
- "Any tangible property, if used, has virtually no value in itself. Any value is in the information which is valuable only when read by the computer and transformed by the computer into its intangible end state of binary pulses."

Sherin presented as evidence several examples of data processing media and illustrated his points by ripping a coding sheet into quarters and then proclaiming that although the sheet was destroyed, the program written upon it still remained in other forms.

Sherin likened DP services to services rendered by other professions such as law and accounting and claimed that the taxation of DP output constitutes discrimination of the DP industry. "For example, it is impossible to distinguish accounting reports produced by data processors from those produced by accountants — I defy you," he said.

In conclusion, Sherin, on behalf of DPMA, recommended that DP be classified equally with the activities of law, accounting and other intangible services. "It makes no sense to levy a tax on the product of those working with input and exempt those working with output," he said.

Support of Adapso

Mike Nugent, staff attorney for the Association of Data Processing Service Organizations (Adapso), voiced Adapso's support of Sherin's views before going on to his formal presentation about time-sharing.

Nugent ran through definitions of "time-sharing," "batch processing," "terminal-to-off-line-terminal processing," "remote batch processing" and "conversational remote job entry," declaring that each should be considered a service and not the rental or lease of computer time.

The question of a time-sharing user's control of the computer system was addressed by a number of attendees, since it is believed to be germane to the taxability of time-sharing.

Sherin differentiated between "the old days" of DP, when people rented straight computer time and assumed control of the system, and present time-sharing, in which the user does not control the system itself but only the system as it pertains to his application.

Proprietary Rights

According to lawyer Bob Bigelow, publisher of the monthly newsletter Computer Law and Tax Report, the reason for the licensing approach to systems software, utility packages and applications programs is the protection of proprietary rights.

"It's not a method of avoiding sales or use tax at all," Bigelow said. "The problem is that if you sell the stuff, you lose control of it; whereas if you license your software you can keep it from going beyond the buyer, at least legally."

Bigelow further suggested that consistency of the sales and use taxation laws between the federal government and state governments as well as among the states themselves would be "helpful."

Nine states in the last year have changed their classification of software to intangible and therefore nontaxable. Those states are Alabama, Florida, New Jersey, New York, Vermont, Louisiana, Minnesota, Wisconsin and Iowa.

Sue Molina, deputy tax commissioner, stressed that the commission has not started drafting the tax regulations and will do so only after examining the rules of other states as well as evidence presented by industry spokesmen. The commission has requested that interested persons file briefs by Jan. 15.

College Team Scores 100% In Programming Contest

GRINNELL, Iowa — Of the 21 teams to take a crack at solving four complex problems at the Fifth N. Central Regional Computer Programming Contest held here recently, only the University of Washington team from St. Louis was able to solve all four in the five-hour time limit.

Grinnell College's team came in second.

The winning team has three seniors and one sophomore. Two of its members are computer science majors, while one is a physics major and the other a mathematics major.

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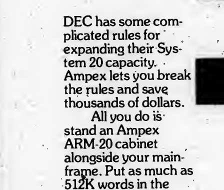

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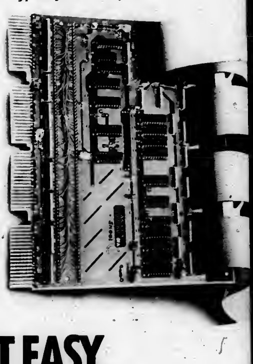

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DP in Market Research Focus of N.Y. Seminar

NEW YORK – A half-day seminar on "Using the Computer in Marketing Research" will be held here on Wednesday afternoon, Jan. 31.

The seminar will be conducted by Mnemonics, Inc. of Norwalk, Conn., specialists in computer systems and services for marketing research. The event will be open to all market researchers attending the three-day Marketing '79 exhibition and conference, set to take place at the Americana Hotel Jan. 30-Feb. 1.

The presentation will cover the advantages and disadvantages of using in-house systems vs. outside services; the alternatives for processing questionnaire and survey data, hints on how to establish an in-house computer survey tabulation operation; and techniques for maximizing the analytical capability of market research tabulations.

The fee for the seminar is $35. Mnemonics is located at 280 Connecticut Ave., Norwalk, Conn. 06854.

Five-Year Forecast

Meet to Explore IBM Directions

CAMBRIDGE, Mass. – Want to know what IBM is going to do in the next five years? An intensive seminar entitled "IBM – The Next Five Years in Automated Systems Integration" may provide some answers.

The seminar, sponsored by the Yankee Group, will be held Feb. 21-22 in Palo Alto, Calif., and Feb. 26-28 in Tokyo.

In California, the two-day seminar will consist of four sessions each day. Session topics will include IBM's new product offerings, the effects of semiconductor technology on IBM pricing and the plug-compatible industry.

A "case study" of Chrysler Corp. will be presented by John Holland, the firm's advanced communications manager.

The agenda will also include discussions of IBM's strategy in the automated office systems area, in communications and in future software, firmware and data base management systems.

In addition, an analysis of IBM's Systems Network Architecture will be presented as one session in Palo Alto and as a full-day discussion in Tokyo.

Other speakers at the seminar, to be hosted by Yankee Group President Howard Anderson, will be Dr. Dixon Doll, president of DMW Group of Ann Arbor, Mich., and Dr. Uhric Weil, vice-president and director of computer analysis for Morgan Stanley in New York.

Cost for the two-day seminar in California will be $550. The three-day event in Tokyo will cost 150,000 yen, or approximately $750.

The Yankee Group can be reached through P.O. Box 43, Cambridge, Mass. 02138.

Law Meeting Set for L.A.

LOS ANGELES – Key problem areas and approaches to computer law will be the focus of the 1979 West Coast Conference of the Computer Law Association and the Law and Technology Section of the Los Angeles County Bar Association. The one-day conference will be held Jan. 25 at the Hyatt House Hotel at Los Angeles International Airport.

The conference costs $30 for members and $45 for nonmembers. Further information is available from Richard L. Bernacchi, Irell and Manella, Suite 900, 1800 Ave. of the Stars, Los Angeles, Calif. 90067.

Audit Seminars Start Jan. 16

PHOENIX – A practical approach to auditing in the DP environment will be presented at the 1979 Honeywell, Inc. auditing seminars to be held in seven U.S. locations.

The seminars will emphasize approaches to internal security, fraud and theft, auditor participation in DP planning and system implementation and the changing role of auditing information in systems, according to a Honeywell spokesman.

More information on the seminars, which cost $425 and start here Jan. 16, is available from R.E. Kukrall, Honeywell, Inc., P.O. Box 6000, Mail Station T-90, Phoenix, Ariz. 85005.

Top Honors in CDP Exam Go to Michigan Analyst

CHICAGO – Robert Taylor, senior systems analyst with the Computer Services Department of Berrien County, St. Joseph, Mich., received the 1978 Certificate in Data Processing (CDP) Award for Excellence – Highest Honors.

This award is presented each year by the Institute for Certification of Computer Professionals (ICCP) to the person achieving the highest aggregate score on the five-part CDP examination.

The exam tests five areas of knowledge: DP equipment, computer programming and software, principles of management, quantitative methods and systems analysis and design.

Taylor, a graduate of the University of Notre Dame, received a special plaque, a $500 check and a CDP key.

The ICCP also recognized eight individuals who achieved the highest score in one of the five sections of the examination. The recipients were Richard Gould, Catonsville Community College, high scorer in the DP equipment section, David McKinley, Southwestern System Service, for computer programming and software; James Barker, Monchik-Weber Association, and Robert Pappas, University of Minnesota, for principles of management; and James D. Muehlenberg, University of Wisconsin, for quantitative methods.

Sharing the award for highest score in systems analysis and design were William Sabota of Star Dental Manufacturing Co., Robert H. Scheer of Central Telephone and John N.C. Yehl of Ryder Truck Rental, Inc.

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Calendar

Jan. 21-24, Denver — OCR — An Answer, sponsored by the Optical Character Recognition Users Association (OCRUA). Contact: OCRUA, 10 Banta Place, Hackensack, N.J. 07601.

Jan. 24-26, New York — **Future Systems Forum**, sponsored by International Information Technology Institute (IITI). Contact: IITI, 60 Austin St., P.O. Box 265, Newtonville, Mass. 02160.

Jan. 28-30, Carmel, Calif. — **Integrated Information Systems**, sponsored by the Institute for Graphic Communication, Inc. (IGC). Contact: Richard D. Murray, Director of Conferences, IGC, 375 Commonwealth Ave., Boston, Mass. 02115.

Jan. 29-30, Los Angeles — **Software Management Conference**, sponsored by the American Institute of Aeronautics and Astronautics (AIAA). Contact: AIAA Conference, Department SMC, P.O. Box 91295, Los Angeles, Calif. 90009.

Jan. 29-31, Clearwater Beach, Fla. — **1979 SAS Users Group International Fourth Annual Conference.** Contact: SAS Institute, Inc., P.O. Box 10066, Raleigh, N.C. 27605.

Jan. 30-Feb. 1, Carmel, Calif. — **MIS and Computer Graphics**, sponsored by the Institute for Graphic Communication, Inc. (IGC). Contact: Richard D. Murray, Director of Conferences, IGC, 375 Commonwealth Ave., Boston, Mass. 02115.

Feb. 5-6, New York — **Seventh Annual DP Audit Seminar**, sponsored by the Institute of Internal Auditors, Inc. New York Chapter. Contact: Hirsch I. Grozalsky, P.O. Box 2519, Grand Central Station, New York, N.Y. 10017.

Feb. 5-9, San Mateo, Calif. — **Strategic Planning**, sponsored by the American Management Associations (AMA). Contact: AMA, 135 W. 50th St., New York, N.Y. 10020. Also being held Feb. 12-16 in Chicago.

Feb. 5-9, Los Angeles — **Computer Systems Analysis & Design**, sponsored by the American Management Associations (AMA). Contact: AMA, 135 W. 50th St., New York, N.Y. 10020.

Feb. 6-8, Vienna, Austria — **Fourth International Symposium on Computer System Modeling and Performance Evaluation.** Contact: Dr. A. Butrimenko, IIASA, A-2361 Laxenburg, Austria.

Feb. 7-9, Washington, D.C. — **Federal ADP Management**, sponsored by the American Institute of Industrial Engineers (AIIE). Contact: AIIE, Computer and Information Systems Division, P.O. Box 3727, Santa Monica, Calif. 90403.

Feb. 8-9, St. Louis — **Seminar on Government Techniques for Contractor Selection**, sponsored by the Technical Marketing Society of America (TMSA). Contact: TMSA Seminars, P.O. Box 91295, Los Angeles, Calif. 90009.

Feb. 11-14, Los Angeles — **1979 Bank Telecommunications Workshop**, sponsored by the American Bankers Association (ABA). Contact: ABA, 1120 Connecticut Ave. N.W., Washington, D.C. 20036.

Feb. 12-14, Denver — **Computer Contract Negotiations Seminar.** Contact: Ruth K. Dargis, Brandon Consulting Group, Inc., 505 Park Ave., New York, N.Y. 10022.

Feb. 12-14, Paris — **International Symposium on Flow Control in Computer Networks.** Cuntact: Institut de Recherche d'Informatique et d'Automatique, Domaine de Voluceau, Rocquencourt BP5, 78150 Le Chesnay, France.

Feb. 12-14, Washington, D.C. — **Effective Computer Operations Management**, sponsored by the Institute for Professional Education (IPE). Contact: IPE, Suite 601, 1901 N. Fort Myer Drive, Arlington, Va. 22209.

Feb. 12-14, Washington, D.C. — **Data Base Design Development and Implementation**, sponsored by the Institute for Professional Education (IPE). Cuntact: IPE, Suite 601, 1901 N. Fort Myer Drive, Arlington, Va. 22209.

Feb. 12-14, Denver — **Management Skills for the New Woman Manager**, sponsored by Advanced Management Research, Inc. (AMR). Contact: AMR, 1370 Ave. of the Americas, New York, N.Y. 10019.

Feb. 12-16, Sao Paulo, Brazil — **Computers/Peripheral Equipment**, sponsored by the U.S. Department of Commerce. Contact: Office of International Marketing, Room 4012, Bureau of Export Development, U.S. Department of Commerce, Washington, D.C. 20230.

Feb. 12-17, Mexico City — **First International Informatics and Office Equipment Conference and Exhibition.** Contact: Investigacion en Informatica y Technologia Avanzadas, Schiller 148 3er. Piso, Apdo Postal 105-148, Mexico 5, D.F.

Feb. 13-15, Toronto — **National Office Exhibition and Conference.** Contact. Canadian Office Magazine, Suite 2504, 2 Bloor St. West, Toronto, Ont. M4W 3E2, Canada.

Feb. 14-16, Toulouse, France — **First European Conference on Parallel and Distributed Computation**, sponsored by the Association Francaise pour la Cybernetique, Economique et Technique (Afcet). Contact: Afcet, 156 Blvd. Pereire, 75017 Paris, France.

Feb. 14-16, Washington, D.C. — **Structured Design Programming**, sponsored by the Institute fur Professional Education (IPE). Contact: IPE, Suite 303, 1515 N. Court House Road., Arlington, Va. 22201

Feb. 15, New York — **Computer Graphics 1979.** Contact: Teresa Crawford, Applied Urbanetics, Inc., 1701 K St. N.W., Washington, D.C. 20006.

Feb. 19-22, Orlando, Fla. — **23rd International Operational Data Security Workshop.** Contact: Robert J. Wilk, President, Operational Data Security Corp., 6 Swarthmore Lane, Dix Hills, N.Y. 11746.

Feb. 20-21, Minneapolis — **Seventh Annual Digital Equipment Exhibit And Seminar.** Contact: Clarence K. Peterson, Sales Manager, Deerland Distributors, Inc., Hennepin Sq. Bldg., Minneapolis, Minn. 55413.

Feb. 20-23, Dayton, Ohio — **CSC 79**, sponsored by the Association for Computing Machinery. Contact: Dr. Lawrence John, Computer Science Department, University of Dayton, 300 College Park Ave., Dayton Ohio 45469.

Feb. 21-22, Palo Altu, Calif. — **IBM - The Next Five Years in Automated Systems Integration.** Contact: Kate Cugswell, The Yankee Group, Harvard Sq., P.O. Box 43, Cambridge, Mass. 02138. Also being held Feb. 26-28 in Tokyo.

Feb. 21-23, Phoenix — **Minicomputer Systems**, sponsored by the Institute for Professional Education (IPE). Contact: IPE, Suite 303, 1515 N. Courthouse Road., Arlington, Va. 22201.

Feb. 22-23, Washington, D.C. — **Micrographics for Libraries**, sponsored by the U.S. Civil Service Commission. Contact Dataflow Systems, Inc., 7758 Wisconsin Ave., Bethesda, Md. 20014.

Feb 22-23, Claremont, Calif. — **Conference/Workshop on Business Data Processing/Information System Curricula.** Contact: Dr. Thomas H. Athey, Chairman, Information Systems, School of Business Administration, California State Polytechnic University, 3801 W. Temple Ave., Pomona, Calif. 91768.

Feb. 26-March 1, San Francisco — **Compcon Spring 79**, sponsored by the Institute of Electrical and Electronics Engineers (IEEE). Contact: Compcon Spring 79, P.O. Box 639, Silver Spring, Md. 20901.

Feb. 26-March 2, Dallas — **Intelcom 79**, sponsored by Horizon House International. Contact: Joan Hyde, Assistant General Manager, 610 Washington St., Dedham, Mass. 02026.

Feb. 26-March 2, Clearwater Beach, Fla. — **How to Conduct a Performance Audit of Your Computer System.** Contact: Keston-Barnett Associates, 19 Orchard Way North, Rockville, Md. 20854.

Feb. 26-March 2, San Diego, Calif. — **1979 Winter Meeting of the Association for the Development of Computer-Based Instructional Systems.** Contact: George Lahey, Navy Personnel Research and Development Center, San Diego, Calif. 95152.

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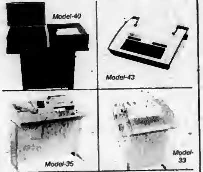

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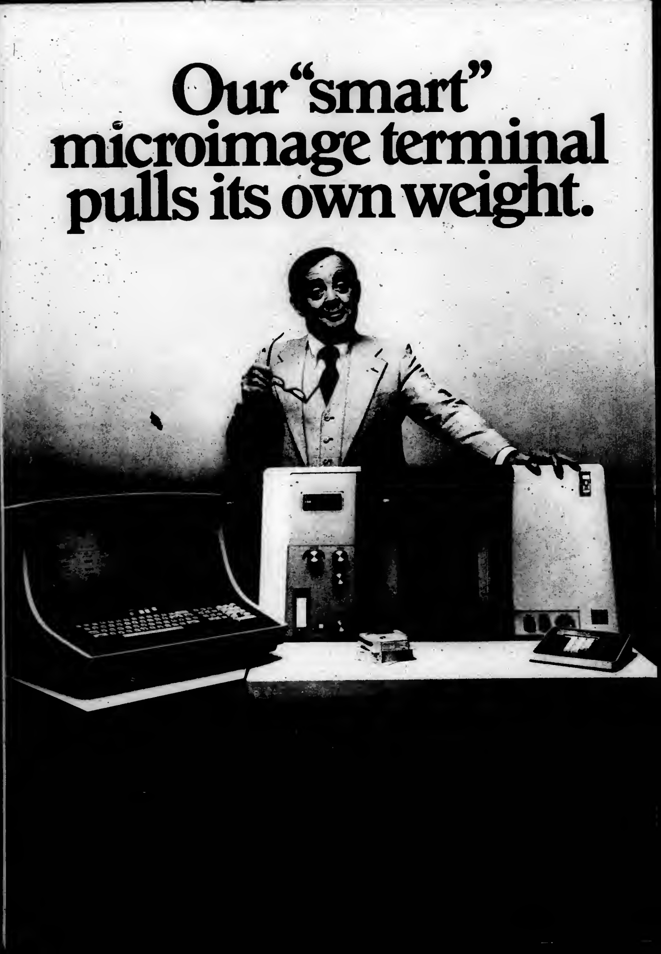
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Editorial

Room for All

When technological innovations pioneered by small companies are recognized on an international scale, it gives encouragement to all the vendors and users striving to improve their operations.

Such was the case recently when the framework for a standard that covers two-wire, full-duplex modems operating at 1,200 bit/sec received tentative approval from a Consultative Committee on International Telephone and Telegraph (CCITT) study group (see story on Page 37).

Modems are not usually considered to be on the cutting edge of this industry. Several years ago, however, Vadic Corp. introduced a unit that would transmit over a two-wire line the same 1,200 bit/sec full-duplex signals that previously required four-wire facilities. Even the most disinterested data user understood that gaining the same capability with half the required lines would dramatically cut his transmission costs.

The use of the Vadic-pioneered concept has grown to be commonplace in this country. Its originator (now Racal Vadic) made such an impact that AT&T and other suppliers came out with similar data sets.

But there were some technical differences between the concepts originated by Vadic and those later introduced by AT&T. The incompatibilities had to be resolved if this type of data transmission were to be available on an international basis for multinational data users. They now appear to have been resolved by the recent CCITT study group meeting in Geneva.

To be sure, modems do not require the same investment as a mainframe. But they represent vital links that allow data to be transmitted across the miles in user networks.

It would have been relatively easy (at least from a political standpoint) for AT&T and the overseas telecommunications authorities to ignore the work Vadic had done to make operations more efficient for the 1,200 bit/sec data user. Instead, a standard was proposed that appears to take some Vadic concepts and combine them with non-Vadic features. The end result will hopefully provide a uniform, international transmission method.

The development of international data communications standards has been significant in the last few years. Despite problems that concern the control and security of data moving across national boundaries, most countries seem to be in favor of international networks.

The CCITT modem standard proposal shows there is room for all innovators in international communications. More importantly, it shows the needs of data communications users are being recognized by monopoly telecommunications providers which have often been less than sensitive to other user issues in the past.

Data Past

Five Years Ago
Jan. 9, 1974

PHILADELPHIA — AT&T was handed a stunning defeat in U.S. District Court when Judge Clarence Newcomer ordered the firm to supply disputed interconnection facilities to MCI Telecommunications Corp. The court action prohibited AT&T from any further delay in supplying facilities to MCI that would allow the specialized carrier to initiate service to many of its customers.

— — —

ARMONK, N.Y. — Thomas J. Watson Jr., one of the original corporate rulers of IBM, retired from the company he and his father turned into the most successful American corporation of the 20th century. Watson took over IBM in 1956 after receiving control of the firm from his father.

Eight Years Ago
Jan. 13, 1971

Independent disk suppliers lowered prices on products for IBM 360 users. The price changes were announced in response to IBM's pre-Christmas disk modifications [CW, Dec. 23, 1970] which effectively extended the use of 2319s to most 360 users and left independent peripherals users at a potential price disadvantage.

— — —

MARTINSBURG, W. Va. — Six states that received erroneous tax tapes from the Internal Revenue Service [IRS] returned them to the IRS National Computer Center here for correction. The tapes were used in auditing state tax returns, comparing those returns with the federal tax reports. The errors caused investment income to vary by as much as 10,000%.

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Letters to the Editor

Private Support for R&D

This note was prompted by a report of remarks by Daniel C. Atkinson, director of the National Science Foundation, at a recent national meeting of the Association for Computing Machinery [CW, Dec. 11]. He was quoted as saying that federal support of R&D has slipped dramatically in the last decade. His implication was that federal support of R&D ought to be increased.

Because I believe in minimizing federal activities, I would plead for finding ways to stimulate private support of R&D activities without simply doling out federal funds. I propose that a modest reduction of federal corporate taxes would provide at least some of this stimulation.

Philip R. Bagley

Narberth, Pa.

Increase in Conference Fees

Further to "Conferences, Tutorials Scheduled by Infotech" [CW, Dec. 18], referring to our plans for U.S. presentations in 1979: The fee for the three-day conferences will be $785 and for the two-day tutorials will be $530. This is an increase from the previously quoted prices of $750 and $500.

These small increases for 1979 were made inevitable because of increased material and labor costs over 1978 and the weakened position of the U.S. dollar against more European currencies. The fee for the combined five-day conference and tutorial remains at $1,200.

David King
President

Infotech International, Inc.
Pasadena, Calif.

Check Digit in Zip Code

Every five-digit number is potentially a "legal" Zip Code. Thus every transposition of digits or other error in a Zip Code produces a Zip Code to which a delivery can be attempted.

The practice of using 99999 in an address to indicate the Zip Code is unknown leads the Postal Service to ship the mail to Alaska.

The plan to expand the Zip Code to include several additional digits presents an ideal opportunity to include a check digit. Then, when the Zip Code on a letter is read or keyed in, it can be validity-checked, and rejection and rechecking can be done at the point of mailing rather than at the point of delivery.

This can also be an advantage to the user in that the Zip Codes in a data base can be checked for validity at the time of data entry or update.

Henry E. Schaffer

Raleigh, N.C.

Playing by the Same Rules

Regarding the new Association for Women in Computing [CW, Dec. 18], please tell me what is so important about women bouncing ideas off other women. I want to bounce ideas off competent, experienced professional people — regardless of their hormonal structure. Women don't want their sex noticed when it comes to job opportunities and advancement, yet they form an organization to establish "a communication network among women DPers."

It has to be one way or the other, ladies — either everyone is going to climb the same "corporate ladder" based on knowledge and performance or we're going to have "separate-but-equal (?)" career paths based on sex. I personally prefer the former. I'll play by the same rules as everyone else and if I win, it will be more of an accomplishment than if the rules were changed in order for me to play the corporate game.

Karen Bartucca

New Britain, Conn.

Reader Commentary

Evidence Points to Bright Future for FM

By Richard S. Mathews
Special to CW

Several articles that have appeared in Computerworld recently have contained statements that tend to discredit the concept of facilities management (FM) as a legitimate, worthwhile DP alternative for companies of all types and sizes.

The published material in question quoted Dick Brandon, president of Brandon Consulting Group, Inc., who painted a bleak, distorted picture of FM, highlighting its drawbacks, severely criticizing it and projecting a future for it that is limited, if not extinct [CW, Aug. 14, 21].

Nothing could be further from the truth.

Brandon claimed that "in the next five years, we are going to see the demise of almost all commercial FM contracting in the private sector." He also said, "If you look at commercial FM contracts, I don't think you can find any that have ever been renewed" [CW, Aug. 21].

As previously reported by CW, various industry studies have revealed that the computer services market (of which FM is a part) is rapidly growing. For instance, Input, Inc., a market research and consulting company, has stated that "computer services has emerged in recent years as one of the fastest growing and most profitable sectors of the techoology field." Annual growth, it reported, is in the 15% to 20% range and revenues are forecast to reach $14 billion by 1982.

FM is estimated to keep pace with the overall industry, with revenues projected to grow from $600 million in 1977 to about $1.3 billion by 1982.

'The computer services market (of which facilities management is a part) is rapidly growing. Input, Inc., a market research and consulting company — for instance — states that "computer services has emerged in recent years as one of the fastest growing and most profitable sectors of the technology field." Annual growth, it reported, is in the 15% to 20% range and revenues are forecast to reach $14 billion by 1982.'

The banking industry, in which I am very active, is a large user of FM. Commercial banks, according to Input's projections, will increase their usage of FM from $130 million in 1977 to $283 million by 1982.

The growth rates of certain FM firms with which I'm frequently in contact greatly exceed the 15% to 20% annual growth rate reported for the entire FM business. Electronic Data Systems Corp. (EDS), which bore the brunt of Brandon's quoted comments, has been growing at a compounded rate of 35% each year since 1968 when it went public.

National Sharedata Corp. has grown since its inception in 1968 to annual revenues of more than $40 million. Systematics, Inc. has grown at a compounded annual rate of 41.5% during the past 10 years.

I, personally, am unaware of any significant events that would cause the business of these firms to fall off or approach extinction within the next five years.

FM Contract Renewals

From firsthand experience, I can attest to the fact that several FM contracts have been renewed. For example, Thrift Data, Inc., a joint venture of several thrift institutions located in Kingston, N.Y., has renewed its agreement with Astradyne Computer Industries. First Security National Bank of Lexington, Ky., has renewed with Metridata Computing, Inc.

In addition, four of my banking clients are currently engaged in contract renegotiations. Three of these, presently serviced by FM firms, are intending to sign FM agreements covering the next few years.

The contract announcement sections of CW and other leading computer-related publications will add to the list of firms that are renewing FM contracts.

Systematics' renewal record is especially worth noting. It has been able to renew nine of 11 contracts. Of the two it failed to renew, one was taken over by a bank holding company. The other customer decided to run its operation on an in-house basis, but it is still using Systematics' software and continues to remain a good customer reference.

FM contract renewals can also be looked at from another point of view. They reflect a general reconfirmation of the concept of FM, even though some companies do not stick with the same FM vendors with which they previously worked.

Brandon also commented on interactive, on-line, transaction-oriented systems that deal with cus-

(Continued on Page 22)

The Taylor Report

New Methods Improve Check Digit Protection

By Alan Taylor
Special to CW

I received a call from Washington, D.C., at Christmas from a person who wanted to discuss check digits. "You're hard to find, Mr. Taylor," my caller said and added that matters not always covered in the literature are at least mentioned in my column.

Check digits are an intrinsic bit of DP. It is the height of irresponsibility to accept input without incorporating some protection against possible error. Check digits are still the most widely used method of protection.

Normally, one selects a weighted system based on either modulo 10 or 11. However a check digit system is evaluated, the findings are presented as a group of percentage figures. They indicate how often in random situations various types of expected errors will be caught and how often mistakes will go through despite the protection offered by the check digit system.

Every decade or so, a system will be chosen on the basis of such numbers. So far, so good.

Expected Errors

The expected errors are generally broken down into three groups: transliteration errors, transposition errors and so-called random errors.

When a number is simply incorrect, it is a transliteration error. For instance, 527 may be written instead of 537. These errors are often caught.

A transposition error involves two digits, often adjacent ones, as when 357 or 573 is written for the correct 537. These errors are also fairly easy to catch in many systems.

However, transpositions can occur in more widely spaced situations. A transposition may be separated by one, two, three or more correctly written and placed numbers, as when 153426 is written for 123456. These are not so simple to catch.

The random-error situation is really a misnomer. All errors, other than elongation or truncation ones, are combinations of the elementary transliteration or transposition errors. When more than one kind of error is present in a single number, the situation is often called "random" because the exact combination of errors is ambiguous.

For instance, consider the number 123456. The 2 and the 5 could be transposed and the 3 could be incorrectly entered as 5 yielding a final version of 155426. But, then again, it could simply be a

(Continued on Page 25)

The Human Connection

Data Communications In Limelight for '79

By Jack Stone
Special to CW

Of the many significant events in the past year, two in particular have very special significance for DP managers: the IBM announcement of the 8100 distributed DP (DDP) system and the Bell filing with the Federal Communications Commission for approval of the Advanced Communications Service (ACS).

Although the two companies are concentrating in specialized areas of the marketplace, it appears both are making serious and significant commitments of resources to data communications. And their actions suggest there will be increasing pressures for management information systems (MIS) organizations to move ever more rapidly into the on-line systems arena, with all its associated headaches.

It is important to the MIS department that the two major vendors are apparently, at long last, trying to meet the total need for data communications products and services. Many MIS departments should be feeling some relief knowing some mighty potent support is on the way to help control the hodgepodge collection of data communications hardware that is scattered throughout most business organizations.

Speaking as one who has suffered the pangs of trying to install and operate a large-scale communications network (though not lately, thank goodness), I certainly sympathize with all who have similarly struggled with those overly expensive, underutilized private networks which, without intending to rub salt into the wound, after all these years are still not adequately free from serious problems of reliability, availability, redesign flexibility, technology upgrade, intercompany interconnect, in-house support and multivendor maintenance.

Assuming IBM and AT&T are truly serious about maintaining a long-term posture in the data communications business, we may be witnessing the beginnings of a great systems leap-forward to common network, common/compatible terminals, common communications software and uncommonly competent maintenance support.

Basis for Optimism

Will such wonders of wonders come to pass? I certainly don't know for sure, but there are indicators that do warrant some optimism.

One of the most interesting is

(Continued on Page 23)

Brandon's Picture of FM 'Bleak, Distorted'

(Continued from Page 21)

tomers. He was quoted as saying that "you can't separate it or move it out" and that "it can be extremely risky to farm out on-line systems."

In a classic sense, this might be so, but to imply that it can't be done is to defy a number of banks that are content in having done just that. A Long Island-based savings bank client of mine immediately comes to mind as a typical example.

This bank's major customer accounts — that is, savings and loan applications — are being processed on-line by an FM firm. In addition, it has installed a turnkey hardware/software minicomputer system from The Saddlebrook Corp.

The system is used to process its financial control applications which include general ledger, budgeting, responsibility accounting and investments.

There is evidence of a trend toward on-line processing by FM firms. In 1973, none of National Sharedata Corp.'s 200 bank customers was served with terminals.

This is the first in a two-part series. Part II will appear next week.

Today, more than 200 terminals are in operation for its 450 banking customers. Ten years ago, none of EDS's business was on-line, but now 90% of it reportedly is.

Seminar Observations

At a seminar I sponsored and moderated for banks during the past year, "How to Evaluate and contract for Facilities Management/Computer Services," it was interesting to hear the experiences and views reflected by nationally recognized spokesmen heavily involved with the FM, service bureau and time-sharing segments of the industry.

Among the panelists, for example, was Coley Clark, senior financial representative for EDS, who pointed out that the key to continued growth of FM is the strategy of hardware vendors.

These vendors tend to focus on the few companies at the very large end of the market where they are concentrating on large mainframes and where communications breakthroughs will soon be felt. Second, they are focusing on the many companies at the bottom tier of the market where the concentration is on minis and terminals.

The middle range of companies, Clark explained, provide the bulk of the FM market. This segment is constantly being fed by the bottom tier as the smaller companies grow.

As these companies become too large to have their work processed exclusively by small machines and simple, straightforward software, they will feel that need for more capability, complexity and flexibility from their DP resource. This takes skilled personnel and more customization, thus making FM an alternative for these companies.

Minis With FM

Another panelist, William T. Webster, executive vice-president for Depositors Trust Co., an Augusta, Maine based, $400 million holding company, pointed out that he was not only in favor of FM, but also the use of minis along with FM.

Webster told the seminar attendees: "I like FM. We've lived under FM since 1975 and . . . I'm sold on the concept. I'm for the idea that some type of DP organization apart from the bank is the way to go.

"Why not let someone else worry about the computer paper costs, replacing the top programmer who just left, the leaking roof on the computer center, the lease/purchase decisions and so on."

He noted that minis "must be considered in any discussion of FM." He said he feels strongly that "there is a direct relationship whenever they can be substituted for a segment of current processing on the CPU, or whenever they permit the acquisition of special programs that are not available for use on the large computer."

Initial Resistance

Elaborating on the use of the mini in combination with a centralized FM mode of operation, he stated: "I first resisted the idea of our trust

(Continued on Page 24)

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The IFB is scheduled to be released by January 16, 1979. Copies may be obtained by forwarding $25.00 to EBMUD. Bidders conference planned approximately 13 days after release IFB.

This is not an invitation for bid.

May Lose by Default

No Time for Silence Regarding DP Taxes

By Robert M. Sherin
Special to CW

Nothing in this world is unconstitutional until so proven, even if it appears to be. Therein lies a crucial problem for data processors. Since my first contact with the software sales tax issue in 1976, it has been common for certain industry lawyers to stand silent in the face of DP taxes that subsequently have been found unconstitutional (as in Florida and New York).

When the State of Tennessee classified software as tangible and taxable after the Tennessee Supreme Court had ruled the identical software intangible in 1976, there was hardly anyone who objected. Writing in *Computerworld*, Roy Fried, a Boston attorney, allowed the action was stupid but expressed the view that it was not unconstitutional.

Now we have what appears to be an airtight challenge (Sherin vs. Tennessee) before a federal appellate court (the Sixth U.S. Circuit Court of Appeals in Cincinnati) to Tennessee's arbitary classification. The industry's basic argument is simply that it is just as irrational to call an intangible tangible as it is to call black white and men women.

Reader Commentary

Again in this case, there are predictions of defeat, but no demonstrated involvement. The industry cannot expect constitutional refuge in the federal judiciary unless it shows an interest itself. Despite the clarity of the issue, not one organization or individual has requested to intervene in the case. Under those circumstances, it is difficult to imagine how the federal court will become involved for the DP industry in a state matter, even if our position is correct.

I urge anyone interested in stemming this new precedent, which could spread to other states, to intervene in the case as a friend of the court or otherwise, lest we lose by default.

Time is of the essence. The court is expected to rule sometime next year.

Sherin is a nonjudicial adviser to the Data Processing Management Association.

Work on Nets In Limelight

(Continued from Page 21)

the radical departure from long-established marketing and product philosophies by both IBM and AT&T. Having been with both of these organizations as a salaried employee, I can assure you they are not given to rapid changes of direction. Plenty of inertia is provided by the established bureaucracies, the long-lead-time product development cycle and, quite obviously, their proven formulas for success.

By my way of thinking, IBM really has done an about-face in taking the DDP route with the 8100. The key, its advertising claims, is that the 8100 can provide network control in addition to the stand-alone processing functions when it is configured as a souped-up, combination miniframe/front-end processing system. This is quite a change from those wine-and-salad days of millenia past when IBM said that the way to go with Systems Network Architecture was with a savory 3032/3 of the 2M-byte to 3M-byte vintage.

And then there's AT&T with such iconoclastic notions of an "intelligent" network with "virtual" circuits and, perish the thought, user programmability. Certainly a shade removed from past traditions of standing pat. When and if the network is formally announced, it is clear customers will insist the Bell System step up the availability of its enormous technical staff to help customers analyze needs and develop proper ACS configurations, a critical resource that has long been absent from the marketplace.

And so the good news is that the biggies seem to be trying to bring order out of the networking chaos. The bad news is that, like it or not, the MIS managers who have been roundly trounced for their inabilities to achieve 101% uptime on their nets are going to see ever more demands for communication data, every which way, in whatever configuration suits management's fancy.

And more and more of you out there will hide under the covers at night, dreading the phone call about network outage.

Hopefully, improved IBM and Bell System support of the nets will let everybody sleep better.

Letters to Stone should be addressed to him at Suite 222, 2233 Wisconsin Ave. N.W., Washington, D.C. 20007.

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Brandon Painted Unrealistic FM Picture . . .

(Continued from Page 22)

department acquiring a Wang Laboratories, Inc. minicomputer with a pension and profit-sharing program. I felt that consolidation within our present shop would be more cost-effective.

"However, a detailed analysis of the projected costs of such a plan convinced me that separation from the central DP operation was more responsive to the needs of the department and also less expensive," he continued.

"If your FM facility can't save you more than 10% of specialized processing functions — such as trust, credit card or portfolio investment — take a long look before pushing for consolidation," he advised his audience.

Webster raised the question, "What is the advantage of a minicomputer if you have a 10% increase in processing costs?" His response was "security of operations."

He explained that "you have one less function that will be affected when the CPU is down for whatever reason. Be it power loss, casualty loss, hardware problems, overheating, program problems or operator error, we're all down at one time or another. At such times, you will be very happy the processing for some of your functions is done off-site."

In my opinion, to date, the greatest impact of the mini within the computer services business has been on the general-purpose, low-volume service bureaus, not on FM. Many customers of these companies are switching to their own minicomputers once service charges reach the $500/mo to $1,000/mo range.

To combat this trend, service bureaus are taking on a line of minis themselves and are developing packaged services that tie into their new line of hardware.

Remote batch processing centers and larger multimillion-dollar-revenue service bureaus are also becoming distributors of minis. Computer Management Systems of Indianapolis is such a company.

Although I have seen no such analysis, I suspect that minis have played a big role in expanding the overall computer service market instead of limiting it. The activities announced by two large timesharing firms, ADP Network Services and National CSS, Inc., support this view. They said that they were coupling their network services with the installation of minis in their customers' locations.

Automatic Data Processing Network Services, a division of Automatic Data Processing, Inc. (ADP) of Clifton, N.J., installs a minicomputer on the customer's premises that is upward-compatible with the mainframe computer used by ADP to provide timesharing services.

As reported in the *American Banker*, this new service approach — called Onsite — is designed to provide the same types of high-quality, on-line services offered by ADP and its competitors but at less cost and with reduced need for high-cost telecommunications.

FM Trends Predicted

The basic mode of operations of FM companies is expected to change gradually as they increase their use of minicomputers and microprocessors. As I see it, the general characteristics that presently distinguish FM from other kinds of computer services include the following:

- FM firms assume financial responsibility for hardware and staff in most instances.
- They dedicate specific people resources on-site over the life of the contract.
- Contracts usually run for five or more years.
- Processing can be performed either on-site or remotely.
- Data entry and output functions are almost always on-site.

Within the next five years, I see FM computer operating personnel no longer being required on-site except at banks with assets of more than $200 million.

The FM firms will develop the software for the minis that will be installed at user locations, while the FM firms will tend to consolidate their own operations on a regional and national basis where large-scale mainframes will be used.

The impact plug-compatible microprocessors will have on FM is difficult to estimate at this time. But designers of microprocessors are predicting that within five years they should be capable of duplicating — in microprocessor form and at microprocessor prices — today's large CPUs in speed and memory size.

EDS' 1978 annual report mentions the establishment of a major development group for microprocessor software. From this, it's evident that it believes microprocessors will have a significant impact on its basic business.

Specialized Services

A growing number of computer services are being offered by specialists on a time-sharing and service bureau basis, services that compete successfully with both FM and in-house mainframe alternatives.

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- Forward/Backward paging
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EXTENDED PROCEDURE LIBRARY SYSTEM
- Logical Test and Branch Facility
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  - —Private Source-Statement Library
  - —System Source-Statement Library
- Conditional execution at execute time

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Examples of these services and the specialists that provide them include:

- Bond portfolio processing — Warrington Associates.
- Cash management — Rapidata, Inc.
- Check guarantee system — Telecredit, Inc.
- Consumer credit information — TRW, Inc.
- Credit card processing — First Data Resources.
- Econometric forecasting — Data Resources, Inc.
- Financial planning-simulation — Olson Research Associates.
- Payroll accounting — ADP, Inc.
- Security pricing — Interactive Data Corp.
- Trust accounting — SEI Corp.

Characteristics associated with these specialized services include one or more of the following: a proprietary data base; a comprehensive, well-supported system; large-scale equipment and program library; and ease of modification.

Outside Services

The DP user is sometimes confronted with the question, "Do you have your own DP installation, or do you use a service organization?" The user might very well have his own computer installation but — more than likely — he also utilizes outside services.

William E. Hutton, vice-president at ADP, Inc. of Clifton, N.J., told the meeting that "while banks less than $100 million will continue to use outside services, they will opt for installation of some in-house capability at least for item capture and printing . . . At the same time, larger institutions will find DP operations more complex.

"This will mean that many will turn to facilities managers for overall operations or data service companies for specialized applications."

Bernard Goldstein, who at the time was senior vice-president for Tymshare, Inc. (now chairman of National CSS), told the seminar audience that "selective purchasing" of computer service vendor offerings is the best answer for satisfying the internal requirements of banks. He noted that "there are hundreds of firms to choose from that provide highly specialized services of value to banks."

There's no doubt about it: the vendors providing specialized services will certainly eliminate some processing potential that now exists for FM firms. Some of these services — such as credit card processing and automated customer services activities — are large enough in some instances, however, to support stand-alone FM operations.

Richard S. Mathews is a management consultant in the banking and finance field and has been negotiating FM contracts for clients since 1972.

Check Digits Need Checking

(Continued from Page 21)

case of three separate transliteration errors.

Dangerous Numbers

What the percentage figures from a check digit evaluation really mean are that some numbers are safe and others dangerous. If 92.5% of a certain type of errors are caught, then 7.5% slip through. Those numbers that will slip through, the dangerous ones, can be predicted.

For instance, take an 11-digit number in a modulo 10 scheme that has a check digit of 1. Let us do the 10 possible transpositions involving the first number with the second, the third, the fourth and so on up to the 11th digit. Then, let us work out the check digits for the incorrect number.

Are any of these in the check digit 1 area? If so, you have caught a dangerous pair — two numbers that are sufficiently connected to be confused, but which will not be caught by the check digit system.

Real Meaning

That is the real meaning of those accuracy percentages; they indicate just how many dangerous pairs of numbers (which should not both be used) exist.

In fact, it is easy to use computers to check whether a new number about to be issued might be confused with another number that has already been issued. It is necessary only to find the new check digit, the group of dangerous numbers, those in the group with the same check digit as the proposed number and whether such a number has been allocated.

This is simple for computer people. The fact that our predecessors, the punched-card people, didn't protect their check digit systems similarly is irrelevant. They didn't have the capability.

We should not be held back to the standards of quality used by punched-card systems.

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DEC Updates IAS, VAX Environments

• VAX Gets Cobol, Sort, Isam

MAYNARD, Mass. — A series of software products designed to strengthen the VAX-11/780 systems's role in educational and technical administration has been introduced by Digital Equipment Corp.

Said to take advantage of the VAX-11/780's 32-bit architecture, the products include a Cobol compiler, a multikey Isam file access capability and a sorting facility. An implementation of Datatrieve, the query language/report writing system, is also available for use in 16-bit compatibility mode, a spokesman noted.

The products complement DEC's previous offerings of Fortran IV-Plus and Bliss-32 for VAX users, he noted.

The VAX-11 Cobol conforms with ANS 1974 specifications. It includes a nucleus, table-handling and I/O modules for sequential, relative and indexed sequential file access, as well as interprogram communications and a library facility, the spokesman said.

Direct Calls

The use of 32-bit object code allows direct calls to the operating system, subroutine calls to and from other VAX-11 languages, transparent access to Decnet and the use of the VAX virtual memory address space. The compiler also accepts Comp-3 — packed decimal — data and utilizes VAX-1 string manipulation instructions, he continued.

Scheduled for delivery in March, VAX-11 Cobol 74 will cost $7,700 for a single system.

The native mode multikey Isam facility has been added to the VAX-11 Record Management Services (RMS) supplied with the VAX/VMS operating system. RMS Isam provides a primary key and as many as 254 alternate keys for access to each record.

RMS is supported directly in Cobol 74 syntax and is compatible in disk formats with RMS-11 on PDP-11 systems, according to DEC.

VAX-11 Sort works with all RMS file organizations and record formats, sequencing data according to record tag, address and index sorting methods. It functions with Ascii, binary decimal, packed decimal and zoned data, the spokesman added.

The sort can be used as a stand-

(Continued on Page 28)

• IAS Gains Real-Time Aid

MAYNARD, Mass. — Version 3.0 of the Interactive Application System (IAS) from Digital Equipment Corp. is said to combine the real-time RSX-11D and multifunction IAS operating systems into one product for users of DEC's PDP-11 minicomputers.

The current release, scheduled for delivery this month, runs on PDP-11/34, PDP-11/60 and PDP-11/70 systems and is upward-compatible with existing versions of RSX-11D and IAS. Three different implementations of IAS Version 3 can be generated to meet applications now served by the two separate systems, a spokesman said.

Depending on options selected at system generation time, IAS takes on the characteristics of a real-time system, a multiuser system with a heuristic scheduler or a full time-sharing system that runs concurrent time-sharing, batch and real-time tasks, he explained.

The real-time and multiuser options are compatible with RSX-11D in both the performance and

(Continued on Page 28)

TP Monitor Links Added to 'OWL'

ATLANTA — The On-Line Without Limits (OWL) program development system from NCI, Inc., previously accessible only through IBM's CICS teleprocessing monitor, has now been adapted to work with a range of other data communications facilities.

Specifically, the system now works with Task/Master from Turnkey Systems, Inc., Westi from Westinghouse Electric Corp., Environ I from Cincom Systems, Inc. and Shadow II from Altergo Systems, a spokesman said. An interface with CBA/Swift from CBA International should be ready "soon," he added.

The availability of so many interfaces means, very simply, that the user is free to shift TP monitors whenever such a move seems appropriate, without disrupting or losing on-line program development facilities, he asserted.

Although providing program development support under so many teleprocessing environments is unique to OWL, the software also has a number of internal facilities that make it valuable to the IBM DOS or DOS/-

(Continued on Page 28)

'Tums' Tied To Total 8.0

ATLANTA — The Total Utility Maintenance System (Tums), developed by NCI, Inc. to support operations under Cincom Systems, Inc.'s Total data base management system, has been updated with an enhanced UNLOAD capability and with support for Total 8.0 under both DOS and OS.

Tums provides the data base administrator with a wide spectrum of facilities ranging from the ability to create a data base or

(Continued on Page 28)

Fortran Validity Tests Ready

WASHINGTON, D.C. — Extending its range of interests in programming languages, the Federal Cobol Compiler Testing Service has released the initial version of a validation system for compilers implementing the 1978 Fortran standard. Promulgated by the American National Standards Institute as X3.9-1978, the standard is known more familiarly as Fortran 77 because it was out for review that year.

Version 1.0 of the 1978 Fortran Compiler Validation System (FCVS) was designed to test the subset language as defined in Fortran 77 — the heart of the standard that is essentially compatible with the now outdated Fortran 66 standard, a spokesman for the testing service said.

The test routines are for the most part stand-alone programs, available on a source program library tape. A loader program written in Fortran is provided to load each of the programs making up the FCVS on a user's system, thus easing their use by any federal agency, private DP site or vendor.

The tests themselves are progressively more complex exercises of statement combinations representing typical language usage. They can be used to evaluate compiler usability and conformity with the 1978 Fortran standard and can aid in the precise identification of compiler flaws, the spokesman asserted.

The test routine outputs are tailored to aid in the specific diagnoses of instances of nonconformity or of compiler errors. For each test, the output indicates whether the compiler passes.

If a compiler fails a test, both the correct results and the compiler-produced results are displayed in the output report. The audit routines are designed so the user can quickly locate the source code which caused the failure, the spokesman said.

The FCVS 78 package is available from the National Technical Information Service (NTIS) as AD-A062036 on either 800- or 1,600 bit/in. 9-track, Ascii-formatted tape for $450. A user's guide (AD-A062037) costs $9 while detailed test specifications (AD-A062038) costs $25. NTIS is at 5285 Port Royal Road, Springfield, Va. 22151.

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PDP-11 Users Get Blending Of RSX, IAS Environments

(Continued from Page 27)

user interface areas, the spokesman claimed, while the time-sharing facility represents an enhancement of IAS Version 2, serving up to 32 interactive users on a PDP-11/70.

That user load is twice the capacity of IAS versions previously available and puts this system at the same level of multiuser terminal support provided by DEC's RSTS/E environment.

IAS Version 3 is said to offer current users of RSX-11D a larger number of language processors than they have now. Basic-Plus 2, Cobol, RPG-II and Coral-66 as well as Fortran IV and Fortran IV-Plus, according to DEC.

In addition, IAS data services include the multikeyed Isam capability of Record Management Services (RMS), a data base management system, a sort and Datatrieve, a conversational query language and report writing system, the spokesman said.

The enhanced operating system also offers support for several recently introduced DEC peripheral units, he noted.

IAS Version 3 is available for a single-system license fee of $17,160. Current customers with RSX-11D or IAS systems still under warranty can obtain the software for the cost of its distribution media. Other RSX-11D users can order IAS Version 3 before July 1 for $1,100.

'Tums,' Total 8.0 Tied

(Continued from Page 27)

modify an existing one to the means of dumping/restoring a data base to and from disk or tape or repairing data sets with broken linkage chains, an NCI spokesman said.

The updated version supports all versions of Total, not just Version 8.0, he said, adding that he assumed support of the Total Information System (TIS) — expected to be delivered by Cincom sometime this April [CW, Oct.9] — will also be provided if users ask for it.

The enhanced UNLOAD function is said to enable users to unload Total variable entry data sets either with or without linkage. Total itself has always offered the ability to read records sequentially, just as they appear on the physical storage media, or serially, picking up records in their logical sequence regardless of where they are physically.

Tums originally managed unloads — record dumps — by going to a master record and then reading variable records serially based on key values. With the enhancement, the NCI utility broadens users' options so they are similar to those under Total, the spokesman explained.

Tums runs on IBM 360 and 370 or compatible CPUs under DOS, OS or their VS counterparts. It costs $3,450, the spokesman said from NCI's new offices at 3720 Longview Drive, Atlanta, Ga. 30341.

'OWL' Linked To TP Monitors

(Continued from Page 27)

VS installation, the spokesman said.

The "dynamic recall" feature, for example, immediately and on demand reconstructs prior program versions as far back as 15 generations, he said. Support for a "moving window" gives the programmer more freedom when looking at data displayed on a CRT screen, he added.

The "window" support can move left, right, up or down so the user can browse over wider and longer logical files than those normally available on the screen. This feature breaks the IBM 3270 "80-character" barrier, NCI claimed.

The system currently supports full-screen text editing, but a split-screen format expected to be ready soon will provide even more flexibility, the spokesman said.

The enhanced OWL is available now for $6,450 from NCI at 3720 Longview Drive, Atlanta, Ga. 30341.

Cobol and Sort Added to VAX

(Continued from Page 27)

alone utility or as an internal subroutine in the user's program, he noted.

Both VAX-11 RMS with Isam and the Sort will be bundled with the operating system at no cost to the user and will be delivered starting in March.

Datatrieve, already available on DEC's PDP-11 systems, helps DP-naive VAX users update and access data stored in RMS files and produce reports through English-like commands, but it also provides support for experienced programmers.

The VAX/VMS version of Datatrieve protects against simultaneous updates and supports all VAX-11 data types, including floating-point and packed decimal data, the spokesman said. This software can be licensed for $2,250.

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'Roscoe' Extended With Cobol Support Option

PRINCETON, N.J. — A Cobol debugging option called Cobol/Ade has been added to the OS-and OS/VS-oriented Roscoe on-line programming system. It provides users with prompting and diagnostic results to assure that even novice programmers get meaningful results from every debug run, according to the vendor, Applied Data Research, Inc. (ADR).

But Cobol/Ade reportedly does more than support the beginner. Sophisticated debugging tools and prompting shortcuts mean the experienced Cobol programmer will be able to identify and solve the most intricate of problems, an ADR spokesman claimed.

Cobol/Ade includes a "specification phase" during which the user defines the purpose of the current test; an execution phase that oversees the running of the Cobol program in batch mode; and an analysis phase that presents debugging output to the programmer for on-line browsing.

Part of the debugging output is a translation of the typical coded system-generation information into terms the programmer can understand without going to a manual. Instead of an "SOC1" operation exception, for example, Cobol/Ade may report that the Abend was caused by attempting to read a closed file, the spokesman said.

In addition to standard debugging features, Cubol/Ade includes a verb-level trace of logic flow and dynamic analysis of nested PERFORM logic — including unresolved PERFORM exits and support for specific, categorical or conditional breakpoints.

An accumulation of program run statistics, including an execution count of all paragraphs and a display of the CPU time used between selected events, is part of the option's capabilities, as is dynamic display of data in Cobol mode, including FILLER and group-level items, the spokesman recounted.

Cubol/Ade is available to Roscoe users fur $5,000 or $275/mo. Roscoe itself costs $28,000 to $31,000 depending on the operating environment in which it functions, ADR said from Rte. 206 Center, CN-8, Princeton, N.J. 08540.

Capex Adds Gulf Products

PHOENIX — Capex Corp. has signed an agreement with Gulf Computer Sciences, Inc. under which Capex assumed full responsibility for the continued support, maintenance, sale and enhancement of the Gulf software product line.

Eight products are included in the arrangement, according to Capex. These include the Tape Library Management System (TLMS); the Partitioned Libraries Management System (PLMS-II); Picking Slip, a program that lists tape and disk volume mounts needed fur a job or jobstream; and Ucandu, a utility for selectively listing and copying data sets.

The other Gulf products taken over by Capex are Jobdoc, an on-line documentation system for production jobs; Restart, a utility for resuming execution of multistep jobs after an Abend or system failure; PDQ, a print spool enhancement system for MVS, SVS and OS/VS1 users; and Storhaus, an on-line system for data set management which is not yet on the market.

To handle these products, Capex has created an Operations Products Division based temporarily in Houston the locale of most Gulf activities. The division will move to Phoenix in February.

The Systems Products Division of Capex will continue to support the company's existing products such as Optimizer-II, Plan IV, Plan IV:MVS, Cotune and 4Tune.

Capex is headquartered at 2613 N. Third St., Phoenix, Ariz. 85002.

DEC Mini Users Gain C Compiler

NEW YORK — Said to be usable under any Digital Equipment Corp. operating system for the PDP-11 as well as under Western Electric Co.'s Unix environment machines, a compiler for the C language is available from Yourdon, Inc.

C was designed to be a systems implementation language that supports structured program design and separately compiled modules. It contains important features for ease of program maintenance, according to Yourdon.

C programs interface well with underlying system environments, specifically with any I/O or real-time control operations and any character manipulation programs such as compilers, graphic packages or text editors, a spokesman asserted.

Language features are implemented in such a way as to make the language and its compiler portable to many different systems, he added.

The current release, capable of running under RSX, IAS, RT-11, RSTS/E and VMS as well as Unix, is said to be a complete rewrite of the RSX-compatible C compiler Yourdon announced in November 1977.

The current package, distributed in binary object code only, costs $5,000. Discounts are available for educational institutions or for multiple CPUs.

The vendor is at 1133 Ave. of the Americas, New York, N.Y. 10036.

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Central Monitor the Key

MVS Tuner Light on Overhead

SUNNYVALE, Calif. — The Comprehensive Management Facility (CMF) software just introduced by Boole & Babbage, Inc. is said to offer a reliable method of tuning and capacity planning without the burden of heavy overhead for systems running under IBM's MVS.

CMF collects and reports system performance data to provide comprehensive measurement of both hardware and software activity, a Boole & Babbage spokeswoman said. The package is designed around a master monitor that provides common services — data collection, timing and data output — to a variety of sample- and event-driven submonitors, she explained.

The submonitors address diverse areas of measurement such as CPU usage, data set optimization, bottleneck contention, queuing and operational activity. CMF minimizes overhead, the spokeswoman asserted, because submonitors are invoked only as needed, without duplication of effort.

For the operations staff, CMF provides interactive real-time problem detection. For planners, the system allows simultaneous long- and short-term trending, data collection and reporting.

All report periods are user-defined and a range of graphics, including Kiviat graphs, are available to make the results more understandable or meaningful than they might be in tabular form, the spokeswoman said.

The introduction of CMF does not signal the end of the sale or support for any of the vendor's other software products, even though CMF may overlap their capabilities, she noted.

CMF is available now for $16,000 from Boole & Babbage, 510 Oakmead Parkway, Sunnyvale, Calif. 94086.

'Conman' Ties CPE, DASD

NEWTOWN, Conn. — The Contention Manager (Conman) package combines computer performance evaluation (CPE) and direct access storage device (DASD) space management to enhance the positioning of data sets on or across volumes in an IBM 360, 370 or compatible environment, according to the vendor, Performanse, Inc.

The software works with the user's SMF records generated under OS or OS/VS to build a data base of disk and data set activity. In its simplest use, Conman documents the points of contention created as different programs try to use one or more data sets on a disk pack, a spokesman explained.

While this basic report may be enough to show where and how changes in data set positioning should be made, many users find they need more help, and the Performanse package is said to provide that support through a "what if" facility.

This capability enables the user to model the entire disk operation, both as it actually exists and as what appears to be a better organization. The proposed organization can be effectively structured and then evaluated by creating a copy of the SMF data with the disk assignments of the data sets modified to reflect what the user believes would be a more effective placement.

Once the altered SME has been generated, it is run against the base logic of Conman; the report of contention in the revised but simulated setup can be compared with the contention in the real data set layout or to other proposed — simulated — positionings, the spokesman noted.

The simulation capability can also be utilized to determine what might happen if part of the data set load was moved from the device or devices it is on to a different type of unit — from IBM 3330s to 3350s, for example.

The package costs $4,400. After the first year, maintenance costs 15% of the existing purchase price per year, the spokesman said from 45 Cedar Hill, Newtown, Conn. 06470.

Memorex Marketing 'QCM'

SANTA CLARA, Calif. — Without so much as a mention of the developer of the product, Memorex Corp. has announced that it will market and support the Quantitative Computer Management (QCM) package from Duquesne Systems, Inc.

Memorex's agreement with Pittsburgh-based Duquesne provides the West Coast firm with nonexclusive rights to the product so QCM will be available from either firm, a Duquesne source noted.

QCM has been described as a comprehensive performance improvement and job accounting system for data centers running under IBM's OS/360, OS/VS1, SVS or MVS. In addition to accumulating and reporting activity, the Regulator portion of the package — which is close to being granted a U.S. patent — modifies operations to optimize them.

From Memorex, QCM is available as the Systems Performance Interrogator designed for on-line reporting, which costs $6,000 or more depending on options, and the System Performance Module, designed for batch reporting operations, which costs $9,000 or more.

Memorex is at San Tomas and Central Expressway, here is Santa Clara, Calif. 95052, while Duquesne is at 1511 Park Building, Pittsburgh, Pa. 15222.

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'GBS' Moved to MVP, VS

LOWELL, Mass. — Wang Laboratories, Inc. has adapted its General Business Systems (GBS) accounting software, already implemented on the smaller Wang 2200s, to run on the 2200 MVP and VS systems as well, a spokesman said.

Described as totally interactive modular systems, both GBS/MVP and GBS/VS provide support, at the user's option, for order entry, inventory control, invoicing, accounts receivables, sales analysis, accounts payable, general ledger and payroll.

Built-in functions accommodate such specialized problems as disputed invoices, debit or credit memos, noninventoried products, unusual service charges and general ledger expense distribution, the spokesman noted.

Two Versions

GBS/MVP, written in Basic, allows up to eight workstations and a maximum of 256K bytes of memory. GBS/VS, in Cobol, supports as many as 32 workstations, providing each operator with 1M byte of virtual storage mapped into 512K bytes of real memory.

As seems to be happening more and more with software offered by vendors of small business systems and minicomputers, GBS is not sold to end users directly by Wang.

The company is selling the programs to local distributors who then provide it, with or without customization, to users.

Wang therefore refused to quote end-user costs for the CBS modules.

Further information is available through Wang's computer sales offices, the spokesman said from One Industrial Ave., Lowell, Mass. 01851.

Bookkeeping Backed

FAIRLEE, Vt. — An inventory control and distribution system developed by Country Programmers, Inc. (CPI) is said to provide users of IBM System/3 or other systems that support RPG-II with a complete bookkeeping system.

The package includes accounts payables, accounts receivables, inventory control, ledgers, trial balances and both check and cash disbursement registers. It is capable of producing lists of customers and vendors as well as comparing their sales and purchases in current and prior years, a spokesman claimed.

The system reportedly can produce for the using organization month-end statements containing gross profit percentages along with gross amoont of dollars and cost and selling price, plus the commission on each invoice.

As an offshoot of its base capabilities, the package can generate reports showing slow-moving inventory items and the dollar value of those items so that unnecessary storage can be reduced, the spokesman continued.

Each of the reports is user-selectable so the user organization can contrul the output it gets from the system. Beyond that, the vendor provides source code so the user can make whatever modifications seem appropriate to meet unique needs.

The package costs $1,000 and can be ordered from CPI, Main St., Fairlee, Vt. 05045.

'Slide' Moves Code Between Libraries

OAK BROOK, Ill. — The Source Library Image Delivery System (Slide) is aimed primarily at software vendors who develop software and must transfer the source code to their clients' sites, more often than not using a different source library manager, according to Slide vendor, Chicago Data Systems, Inc.

With Slide, a user can transfer original source code in any of several formats to a distribution tape for transportation to the user site and then from the tape to the user's source library in the same or any of the other supported formats.

Currently the utility can accept or generate partitioned data sets or library images used under Applied Data Research, Inc.'s The Librarian or Pansophic Systems, Inc.'s Panvalet. Support for other library types can be easily incorporated, the spokesman asserted, adding that Slide provides a common-format tape to handle "any combination" of input and output requirements.

Results Tallied

A report detailing the library types, the number and names of modules "delivered" and a statement count of each module is also produced. Module selection by name, if desired, and library control cards — including ADD or REPLACE commands by parameters — are additional functions, he said.

Slide is written in IBM Assembler and is compatible with OS and OS/VS environments. Source code, documentation and a one-year warranty are provided under perpetual license fur $2,500, the vendor said from Suite 150, 2805 Butterfield Road, Oak Brook, Ill. 60521.

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Concatenated Keys Seen Vital to DBMS Use

By Robert E. Roach

Special to CW

It has been said that nothing is so powerful as an idea whose time has come. Yet significant ideas often start out, not with the lion's roar, but rather quietly. Such is the case with concatenated keys.

Over the years, many data base management system (DBMS) innovations have been introduced. These have aimed at the expansion of file structure options, including hierarchies and special directories, and the improved interconnection of files through networking.

Concatenated keys represent a major step forward in the development of both hierarchical and network structures. Their use has been recommended by James Martin in his book *Computer Data-Base Organization* as an integral part of good data base design.

First a word about our terms. A file *heirarchy* is a structure that may have several levels. Each of the levels may have multiple occurrences within the level above it.

A *network* is the interconnection or association of two or more such hierarchical files. The association is made by providing keys in the *host file* (that is, the file view that is used for producing reports). As these keys have counterparts in the associated file, a linkup is obtained. Of course, a DBMS performs the linkage automatically, once the associations have been defined.

There are a number of reasons that the networking of files is useful. First of all, it allows data to be stored once and then referenced by many files, applications or users. Second, it reduces data redundancy and simplifies maintenance. Third, a file network may support relational data base structures.

A *concatenated key* is the combination of two or more keys in a certain order which act as a single logical key. For example, suppose that YEAR and MONTH happen to be stored in different places on a file, perhaps on different levels of a hierarchy. The concatenated key YEAR/-MONTH may be used to reference another file which has YEAR and MONTH fields. Furthermore, the order of the keys may differ in the two files.

Concatenated keys dramatically open up the possibilities of file networking:

- They provide for a better model of the business problem.
- They reduce data redundancy by permitting data to be distributed to the most appropriate level of the file.
- They improve runtime efficiency. This is a result of having to process a smaller fraction of the file by taking advantage of the hierarchical design.

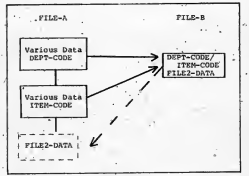

Figure 1

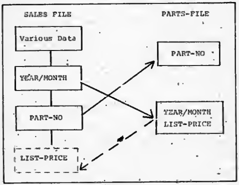

Figure 2

Many types of applications can benefit from the concatenated key approach. Two applications graphically illustrate this.

The first example is what I shall call the department coding problem. Departments in any organization have a propensity for developing their own coding schemes. As a result, different codes are used for the same type of data.

When it is not practical to force all departments to conform, concatenated keys may provide the solution. Simply concatenate the DEPT-CODE and ITEM-CODE. In practice, this approach may be entirely transparent to the user. Figure 1 illustrates a possible file structure for this.

Another common situation is the time series problem. In this case, rates are quoted on a periodic basis — frequently monthly. Two examples of this are list prices for parts and exchange rates for currencies.

In the list price example, the concatenated key would consist of the YEAR/MONTH/-PART-NO. Note that in Figure 2, the sttucture of the associated file shows that the concatenated keys are distributed in the hierarchy.

In conclusion, concatenated keys significantly enhance the flexibility of networked hierarchical files. They provide a powerful tool which both increase the productivity of the system designers and provide a better solution to the business problem.

Roach is a principal consultant for Mathematica Products Group, Inc. He is the author of "Data Base: Practical Issues," which appeared recently in Computerworld.

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NCR Packages Aid Hospitals

DAYTON, Ohio — Three programs to help hospitals order supplies, control inventory and plan and coordinate meal preparation are available from NCR Corp. for use on its interactive 8000 series CPUs.

Described as the central program, and the first to be implemented, is Hospital Inventory Control. This materials-management program covers all hospital departments at all levels, a spokesman said, adding that reports help managers determine required inventory levels, optimal reorder points and generally how to reduce inventory.

The system keeps track of items by specific order and keeps inventory volume using actual item cost by purchase order. The one-time cost for this package is $2,500.

Purchase Orders

The optional Interactive Purchase Order system enables a hospital to generate and later review orders by supplier and by item, using either a CRT screen or a printed report. This package costs $1,250, the spokesman noted.

The third program, the Interactive Dietary Information System, is said to simplify the planning and preparation of meals and provides cooking instructions for all items and the special variations required in a hospital.

Single Staff

The system is particularly useful since it enables hospitals to utilize a single kitchen facility to feed both staff and patients. It displays work to be done for the current meals but also shows what items should be removed from refrigeration for use the next day and which items are in short supply.

The dietary system, which includes the inventory control system, costs $5,000. It can run on the same 64K-byte I-8230 and 125 line/min printer as the other packages but requires 20M bytes of disk storage whereas the others can function with 10M bytes.

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MVS Seminar Planned

HARTFORD, Conn. — Users of large-scale IBM systems have the opportunity to gain a practical understanding of the design and structure of MVS through a five-day course to be presented here Jan. 15-19 by Computer Systems Research, Inc. (CSR).

MVS internal logic, system design and performance will be the basic subjects covered by instructor Howard Gilbert, a senior research systems programmer at Yale University's computer center.

The course is designed for technical, supervisory and systems personnel responsible for planning, implementation and support of MVS in a production environment.

Classes will be held at the Hartford Insurance Group building; the registration fee is $600. More information is available from CSR, 195 W. Main St., Avon, Conn. 06001.

Payroll Included

'CAS' Puts Accounts on HP 250

CLEVELAND — Designed primarily for use by Fortune 1,000 companies in a distributed network and by accounting firms, ISM-CAS is a client accounting system from ISM Corp. for use on Hewlett-Packard Co. Model 250 small business computers.

Applications supported by ISM-CAS are said to include accounts payable, general ledger and payroll processing. They all interface with HP's Image data base management system (DBMS) and therefore can be integrated when that is appropriate, a spokesman noted.

The accounts payable subsystem is triggered by due dates on the user's bills. The general ledger supports distributed operations involving multiple divisions or locations in which accounts are to be kept separate, he added.

The payroll subsystem is designed to handle the computations required by multiple taxing jurisdictions and to support both salaried and hourly personnel. It produces both paychecks and registers as well as W2 and, if required, 941A forms for the federal and state tax authorities.

Functioning as an interpreter-driven system, ISM-CAS can be acquired for $5,000. An HP 250 with Image bundled in its cost and euipped with ISM-CAS should cost "under $30,000," the ISM spokesman estimated from 11000 Cedar Ave., Cleveland, Ohio 44106.

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HP Package Runs Lists

PALO ALTO, Calif. — The List Management package from Hewlett-Packard Co. enables users of the company's System 45 desktop computer to handle mailing label preparation and printing, sorting, sublisting, merge/purge operations and other list maintenance activities, a spokesman said.

The package reportedly allows the user to enter names in any sequence, locate duplicate entries and add, change or delete any name. It also is said to allow the addition of data fields to the list at any time.

The entire list — or designated portions of it — can be sorted according to name, Zip Code, occupation, catalog number, author, title or "any other variable, such as sorting out those names with missing data," the spokesman said.

Generic Searches

The software has the capability of searching for names generically without knowing the correct spelling, he added.

The List Management package can be used on a basic System 45 with keyboard, CRT and one tape transport, plus 64K bytes of memory. That configuration costs "less than $20,000," according to the spokesman. The software, distributed on a tape cartridge, costs $500.

HP's Desktop Computer Division is headquartered at 1507 Page Mill Road, Palo Alto, Calif. 94304.

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By Ronald A. Frank
CW Staff

WASHINGTON, D.C. — A proposed standard for full-duplex, two-wire 1,200 bit/sec modems will impact most network users with this type of equipment.

The proposal, tentatively accepted at a recent meeting in Geneva of the Consultative Committee on International Telephone and Telegraph (CCITT) Study Group 17 on data transmission, covers equipment standards primarily for overseas 1,200 bit/sec modems. If adopted by the CCITT, it will probably be designated the V.22 standard.

The use of full-duplex data sets over two-wire facilities at 1,200 bit/sec was pioneered by Racal Vadic Corp. AT&T later came out with a data set whose transmit and receive frequencies made it incompatible with the Vadic unit.

The dual standards have existed in the U.S for several years, with users selecting their own network preference. The CCITT study group has been meeting to establish an international standard. The result of the recent meeting was described as a compromise, although it appears to favor the AT&T standard.

Analysis

Domestic versions of the 1,200 bit/sec modems are the 212 from Bell and the VA 3400 from Vadic. The compromise reached in Geneva uses the frequencies of the 212 together with features taken from the Vadic unit, industry sources reported.

The Vadic frequencies are said to be more desirable for acoustically coupled operation, which is widespread in the U.S. The overseas telecommunications authorities do not generally support acoustic couplers, however, and Bell has never introduced this type of device in the U.S.

The adoption of the Bell frequencies therefore appears to indicate that hard-wired connections will be mandatory if the proposal becomes an international standard. Despite this, Vadic may continue to support acoustically coupled 1,200 bit/sec operation in the U.S., one industry source suggested.

Three Options

The study group proposal includes three options and reportedly is based on a recommendation made at the CCITT meeting by the British Post Office.

- Option A includes 1,200 bit/sec synchronous operation with 600 bit/sec synchronous capability.
- Option B adds 1,200 bit/sec asynchronous and 600 bit/sec asynchronous operation to Option A.
- Option C includes 1,200 bit/sec plus 0- to 300 bit/sec asynchronous operation in addition to automatic speed recognition.

The inclusion of the 300 bit/sec option came at the urging of Vadic, which believes 300 bit/sec is a more desirable alternate speed than 600 bit/sec. Along with the 300

(Continued on Page 38)

Multivendor Reservations Net Revs Up Airline for Expansion

By Art Landman
And Diane Bell
Special to CW

SAN DIEGO — Pacific Southwest Airlines (PSA) is not only transporting passengers from place to place: it's going places, too — like coast-to-coast and continent to continent.

Currently servicing 13 airports — Burbank, Fresno, Long Beach, Los Angeles, Monterey, Oakland, Ontario, Sacramento, San Diego, San Francisco, San Jose, Stockton and Tahoe — PSA has filed for at least a dozen new cities as far east as Boston, as far north as Seattle and as far south as South America. Approval has been received for Las Vegas and Reno, and PSA "Smiling Birds" will be servicing these areas soon.

The airline's reservations volume, which now averages 30,000 a day, will be increasing proportionately — and that's why a more efficient, reliable communications system became necessary. In order to meet the Civil Aeronautics Board's (CAB) requirements for an expanded route, as well as to meet its own standards for performance and service, PSA faced the task of designing and implementing a new reservations system.

PSA took a look at the latest technology in the data communications industry and the use to which other companies with similar needs had put computer and data communications technology. The result of its search was the Compact Passenger Air Reservations System (Cpars), which went into effect Oct. 29, 1977.

At the computer center in San Diego, the host processor is an IBM 360/65 and the backup computer is an IBM 370/148. For its remote processors and the CRT terminals at the reservations counters, PSA chose Raytheon Data Systems, Inc. as a vendor; the data communications equipment is made by Codex Corp.

The front-end processor controlling the communications environment — selection and switching functions —, is a Raytheon 1020 front end.

Raytheon 1200s are used as remote processors. They are installed at 11 locations — San Francisco, Sacramento, San Jose, Oakland, Ontario, Burbank, Long Beach, Tahoe, Fresno, San Diego and Los Angeles.

All 29 Raytheon 1020s are used as local processors, and the number assigned to each airport or ticket office depends upon the amount of equipment operating on each 1020. The 1020s can support a maximum of 31 CRTs, but PSA assigns only a maximum of three to each.

When the system is complete, each individual counter position will have a CRT, a ticket printer, a credit-card reader and an Extel Corp. printer.

The keyboards on the CRTs were modified by Raytheon to PSA's specifications, as were the ticket printers which produce a multiple-copy ticket.

The PSA printers are "canoe" printers; they produce a singlecopy ticket, perforated to divide into segments. The credit card readers and the Extel printers are both standard products, purchased unmodified by,

(Continued on Page 38)

Canadians Get 103-Type Unit

OTTAWA, Ont. — The Computer Communications Group has introduced the Type 212 modem, designed to operate with the Datacom 1200 teleprinter and other 1,200 bit/sec asynchronous terminals.

The Type 212 synchronizes the data between two points and allows 1,200 bit/sec terminals to communicate asynchronously in full-duplex mode.

Besides operating at 1,200 bit/sec, the modem can also be used for lower-speed equipment in the 0- to 300 bit/sec range. It is compatible with existing Bell 103-type modems for lower speed transmissions.

Based on the Sangamo T212A, the Type 212 is expected to cost $70/mo plus $17/mo maintenance if filed tariffs are approved, a Bell Canada spokesman said. The modem is available to Canadian users.

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Terminals Get More Diskette

HORSHAM, Pa. – Digi-Log Systems, Inc. has added a dynamic file allocation capability to its Microterm II intelligent terminal system that reportedly extends the system's diskette storage capacity.

Diskette storage space is automatically assigned as needed by the system software, the vendor said. After naming a sequential or indexed sequential file, the user enters the record size and estimates the approximate number of records the file will contain; an initial minimum record storage capacity is then specified.

The Microterm II file control system assigns pages of storage as needed, Digi-Log continued, noting the page size is computed by the system on the basis of minimum file capacity and anticipated maximum size specified by the operator.

The file control system packs multiple records into single sectors of storage, the vendor stated.

The Microterm II supports the indexed sequential access, sequential access and direct access methods and features a dual-processor direct memory address architecture, up to 88K-bytes of RAM and up to 1.2M bytes of diskette storage.

In OEM quantities, the Microterm II with the file allocation capability costs under $6,000, the vendor said from Babylon Road, Horsham, Pa. 19044.

Net Anticipates Airline's Growth

(Continued from Page 37)

the airline.

Typically, one 1020 will support four CRTs, four ticket printers, four credit card readers and one Extel printer.

There are CRTs in areas other than at the reservations counters, such as gate areas. At stations where PSA has operations areas or training areas, for example, the CRTs work directly off the 1200s.

In Los Angeles, the 1200 supports CRTs at a training area, an operations area and all gate areas. In addition, at the Los Angeles airport there is a portable podium at a gate which PSA shares with another airline. This podium, too, works off the 1200.

There are seven primary circuits in Cpars. Three are multipoint, while four are point-to-point. San Jose airport, the Oakland gate area and the Oakland ticket counter are on a multipoint circuit, with two tail circuits from San Jose to Monterey and from the Oakland ticket counter to the San Francisco City Ticket Office.

Ontario, Burbank and Long Beach airports are also on a multipoint circuit. And on the third multipoint circuit are Fresno and Tahoe, with a tail circuit from Fresno to Stockton.

The four point-to-point circuits are for San Francisco, San Diego, Los Angeles and Sacramento. There is a secondary circuit linking the Sacramento airport to the Sacramento City Ticket Office.

Because of the multipoint circuits in the Cpars network, PSA was interested in fast turnaround time for response on the multipoint lines as well as reliability. PSA decided on Codex as the vendor for modems.

Codex's Fast-Poll modem is a high-speed, automatic and adaptively equalized modem combining the fast 9 msec RTS/CTS response time typical of 2,400 bit/sec modems with a throughput of 4,800 bit/sec units. The modems begin transmitting data at 2,400 bit/sec and then "gearshift" up to 4,800 bit/sec once the equalization process is complete. The result is fast response and high throughput.

In the point-to-point configurations, the modems are equipped with a dual dial backup option which enables them to be switched over to dial-up lines in the event a private line goes down.

Reliability Through Backup

Reliability is a primary concern to PSA, and Cpars operates with an average uptime of 99.8%. One way of ensuring this reliability is to have backup equipment at almost every level in the system.

As mentioned previously, the IBM 360/65 has a backup computer, an IBM 370/148, in standby mode, available to take over should the primary unit fail. With the use of the second computer, PSA can continue to make accessible to its offices and stations information on seat reservations, passenger check-in, cargo and crew check-in, flight planning and in-flight data control.

The front end processor, a 1200, is backed up by a Raytheon 1020.

Except for the stations operating off a tail circuit (Monterey, the San Francisco ticket office, Stockton and the Sacramento ticket office), there are backup modems at each site. Should a modem fail, a hot spare can be switched in automatically from the computer room in San Diego. No intervention is required at the local level.

Backup for the 1200 remote processors and the 1020 minicomputers is chiefly ensured by having the 1200 store a small portion of the data base from the CPU.

If a 1200 goes down, tickets can still be printed by accessing the 1020s.

Technical Controls

Another of PSA's requirements was for technical control facilities at a central site to make possible monitoring, diagnosis and some degree of control over remote equipment. In the central computer room in San Diego, there are three racks configured and installed by Codex. Two of the racks have the Fast-Poll modems, and the third is for technical control equipment.

The technical control equipment includes Codex's Circuit Quality Monitoring System (CQMS), Multipoint Control System (MNCS), digital and audio patch panels, a general-purpose oscilloscope manufactured by the Hewlett-Packard Co. and a Spectron Corp. Datascope.

The MNCS provides the capability for remote test, control and reconfiguration of the multipoint modems. Used in conjunction with the Codex Line-Sharing Unit (LSU) and Codex's Dial Backup Auto Answer Unit (DBAAU), an operator at the central site can dial past a downed private line and be automatically connected to the modem at the remote site by the DBAAU.

MNCS enables the user to switch from the dial-up network back to the private line without terminating the dial-up calls. This feature allows the operator to check for private-line restoral without having to redial the backup lines if the private line is still nonfunctional.

An optional modem substitution switch, located at the remote sites, allows the operator to automatically switch in a backup modem at the remote site using the MNCS at the central site.

A standard feature of the MNCS is the capability to address all of the modems on the multipoint circuit and cause them to downgrade to a lower speed (in PSA's case, from 4,800 bit/-sec down) in the event that the dedicated line has degraded, but not gone down entirely. This can be ordered on the outbound side only, the inbound side only or on both.

The Codex CQMS enables the operator at the data base in San Diego to monitor, test and diagnose network performance without interrupting data transmission. CQMS is able to warn of line degradation or failure so the line can be bypassed without causing transmission delays.

Landman is director of computer services and telecommunications and Bell is telecommunications supervisor at PSA.

CCITT Drafts Modem Standard

(Continued from Page 37)

bit/sec capability. Option C modems will be able to automatically shift from one speed to another without operator intervention.

If the proposal is adopted, overseas sites with V.22 data sets may be able to access U.S. sites, but domestic sites with Bell 212s or VA 3400s will not be able to transmit data to V.22 locations, according to one industry expert.

Despite this problem, solutions are available. U.S. modem suppliers will probably begin to provide users with V.22 compatibility soon after the standard is finalized. For users who do not want to swap data sets, it is expected that public data networks such as Telenet and Tymnet will provide customers with the ability to transmit data between both types of modems; the network will be the party that overcomes any compatibility problems.

Meeting Planned

Nevertheless, multinational private-line circuit users will probably have to install V.22-type data sets at all sites. It does not appear feasible to modify presently installed data sets, the industry source said.

The V.22 standard will not become final until the fall of 1980, when the CCITT holds its next plenary meeting. In the meantime, the working parties of Study Group 17 will meet Sept. 11-19 at Boulder, Colo.

Details about the committee meeting and the proposed standard can be obtained from the chairman, Ted de Haas, U.S. Department of Commerce, Institute of Telecommunications Sciences, Boulder, Colo. 80302.

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Uses Four Mini-Based Systems

Lipton Network Monitors Product Distribution

Special to CW

ENGLEWOOD CLIFFS, N.J. — A distributed network of four minicomputer-based turnkey systems is helping to speed shipments, improve customer credit checking and reduce order entry rates at Thomas. J. Lipton, Inc.

The four DMS-1000 systems from Distribution Management Systems, Inc. (DMS) of Bedford, Mass. are used primarily for on-line order entry and inventory update at four regional Lipton offices in Chicago; Memphis; San Mateo, Calif.; and Rochelle Park, N.J. They are linked to an IBM 370/158 at the Lipton central computer facility here and to 36 Lipton plants and private and public warehouses across the country.

Orders are usually phoned to the regional offices each evening by salespeople and captured on telephone recording equipment. In critical situations, orders may be phoned in during the day to order entry operators.

In either case, the operators enter the orders directly into the DMS-1000 system, which includes 2 Digital Equipment Corp. PDP-8 minis and CRTs and DMS software.

Credit Check

The operators complete a credit check for each customer through the DMS-1000 disk files that are updated nightly by the central computer. The orders are also checked against unregistered orders, those that were just shipped, those that have not yet been cleared for invoicing or those that are on order.

Further editing may reveal invalid orders; which are then suspended and forwarded either to the credit manager, to the sales service manager or to the distribution manager for special handling.

Once valid orders are entered into the DMS-1000, the system selects the appropriate routing and carrier and checks the price requirements to make sure the proper weights and price breaks are being supplied. Further checks are made against the product, sales division and salesperson files to make sure all information is correct.

For rush orders in some regions, the DMS-1000 forwards the bill-of-lading information to the appropriate plant or warehouse, where they may be printed out on a Datapoint Corp. 1100, a General Electric Terminet 30 or a TWX terminal. Rush orders are received on a special recording unit.

At the end of the day, the DMS-1000 lets the regional offices know which bills of lading have been sent out to warehouses and forwards the balance to headquarters for storage and transmission at a later date, based on a calculated shipping date. All orders are printed out on TWX or Terminet 30 terminals at plants or public warehouses. This network uses 110- or 1,200 bit/sec asynchronous dial-up lines.

At the end of the day, each warehouse or plant also sends a daily activity report over 300 bit/sec binary synchronous lines to a Datapoint 1100 processor at company headquarters. These reports are accumulated and forwarded to the 370/158, which updates the master files and those of the four DMS-1000s, indicating shipments, updating inventory and providing order processing control reports.

The 370/158 also prepares invoices and a variety of management, sales and accounting reports.

At initial order processing time, the DMS-1000 prepares order acknowledgments and various reports for distribution management, as well as invalid orders.

Batch System Replaced

The DMS/1000 network replaced a centralized paper tape order entry system that processed two batches of orders daily. But error rates were high — about 25% — and it took at least 24 hours to do something about rejected orders.

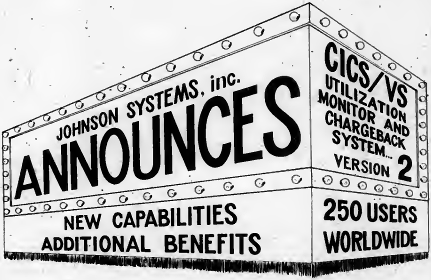
This meant a lot of shipments had to be made the following day. And communications costs were high because so many invalid orders had to be sent back for clarification.

Now the error rate is below 10%, communications costs have been substantially reduced and all orders that require rush shipments can be sent out the same day. Although the order entry workload has almost doubled since the system was installed more than four years ago, the distribution force is smaller now than it was then.

After studying the requirements of a system that would provide centralized control with decentralized execution control, Lipton decided not to develop the system in-house.

Instead, it turned to DMS, which specialized in distribution information processing and has developed several similar systems.

Working closely with the vendor on the system analysis and design, Lipton's system was developed with a $500,000 investment and two people over a 14-month period. Lipton believes doing that same job in-house would have cost perhaps $2 million to $3 million and required a development effort of 40 to 60 man-years over a period of 2 to 3 years.



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Representatives Worldwide

Rate Increases Asked By Canadian Carrier

OTTAWA — CNCP Telecommunications has asked the Canadian Radio-Television and Telecommunications Commission for permission to boost its rates for certain message, data, private voice and broadcast services.

The commission is expected to rule on the proposals by the end of January.

For Telex/TWX services, CNCP wants a 4% hike in tolls; rental increases of $6 and $5 for the keyboard send/receive and automatic send/-receive units, respectively; "miscellaneous equipment" rental increases of 10%; a 20% jump in Canada-U.S. Telex/-TWX usage charges; and another 20% jump in flat calling, part and outstation charges.

A 25-cent hike on intra-Canada Tel-Tex service charges was also requested.

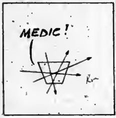
For broadband exchange services, the carrier asked for toll increases in the 3% to 29% range on service up to 2,400 bit/sec; a 10% increase on station connections; and 30% boosts on station connection installation charges.

For private-wire services, CNCP requested an average rise of 16% on Infodat circuitry charges; a 10% average increase on Infodat access; and increases averaging 10% on non-recurring installation charges.

The carrier also wants a 23% average price boost for voice-grade circuits in Quebec and Ontario; average increases of 12% on interprovincial circuits; and decreases averaging 2% for northwestern Canada.

CNCP requested changes in private-wire circuit and loop Teletype-grade charges that include average boosts of 4% in Quebec and Ontario, 2% average hikes for the rest of Canada except British Columbia and 8% average decreases on interprovincial communications.

The carrier also asked for a 10% increase in installation charges for asynchronous Infoswitch connections.



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Service Optimizes Phone Traffic

NEW YORK — Teldata Systems Corp. has announced a network design and optimization service based on the Network Optymizer developed by Telco Research Corp. of Nashville, Tenn.

The Network Optymizer provides communications management with the ability to decide which types of phone facilities to use for outbound traffic, a Teldata spokesman stated.

The program comes with access to inter- and intrastate Wats, tie lines, foreign exchange lines, direct distance dialing and specific storage connective circuit services, the spokesman noted. The ability to establish queuing times is also included.

Teldata will accept input for the service from either Telco-provided tapes or from the output of any automatic identification-of-outward-dialing (AIOD) device, the spokesman continued.

The cost of the service depends on the number of records polled as well as the number of workstations involved, he said. He estimated a configuration of 250 stations would probably incur a charge of about $700. Teldata is at 90 Broad St., New York, N.Y. 10004.

The Bantam. The cocky new $599* CRT that just changed the pecking order.

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Easy to read display	7 x 10 matrix for highly legible characters	Yes	No	No	Yes	No
	Black on white or white on black display	Yes	No	No	Yes	Yes
	Display set deep in hood to reduce glare	Yes	No	No	No	No
	Full 24 x 80 display	Yes	Yes	Yes	Yes	Yes
	Full upper and lower case	Yes	Option	No	Yes	Yes
	Non-glare screen	Option	Yes	No	Yes	Yes
High operator throughput, low operator fatigue	Tab stops/tab key	Yes	No	No	Yes	Yes
	Backspace key	Yes	No	No	Yes	Yes
	Repeat key	Yes	Yes	No	No	Yes
	Shiftlock key	Yes	No	No	No	No
	Separate print key	Yes	No	No	No	Yes
Convenient switching Local/on-line	Local—remote key	Yes	No	Option	Option	Yes
International Character sets	French/German/Swedish/Danish/British/Spanish	Option	Option	No	Option	Option
High speed numeric	Integrated numeric pad	Yes	Option	No	Yes	Yes
Convenient system interfacing	RS-232/CCITT-V24	Yes	Yes	Yes	Yes	Yes
	Current loop	Option	Yes	No	Yes	Yes
Simplified program debugging	Transparent mode and displayable control characters	Yes	No	No	No	No
Faster maintenance	Self-test	Yes	No	Yes	No	Yes
Minimum desk space	Small size	15Wx 19Dx 14H	15.5Wx 20.2Dx 13.5H	15.5Wx 20.5Dx 13.5H	15.5Wx 20.5Dx 13.5H	21Wx 23Dx 14.5H
Printer port	Printer port	Option	Yes	No	Yes	Option
Cost effectiveness	Qty. 100 OEM price	$599†	$740	Less than $550 in quantity 1000	$860	$895

*In quantities of 100
†Qty. 1, End User Price $966.

Uses Variety of Gear

Mitsubishi Motors' Net Ties Six DP Centers

By Ronald A. Frank
CW Staff

TOKYO — Tying six DP centers into an on-line network is a formidable challenge for any company and things are no different at Mitsubishi Motors Corp.

The company first began to configure an on-line network in 1967 and now has a variety of terminals and mainframes, according to Katsuyoshi Arai, project manager in the Management Information Systems Department.

The Mitsubishi network includes an IBM 3033 in Tokyo and another in Nagoya as well as a 370/138 in Kyoto and a 148 in Mizushima. In addition, the firm has a Univac 1106 in Okazaki which will soon be upgraded to an IBM 370/158. A Univac 1100 is in operation at the Kawasaki works and this will also be upgraded to a 370/158 in 1979, Arai explained.

Among the terminals operating in the network are IBM 3270s, Tektronix, Inc. 4014s, Mitsubishi 345s, Univac Uniscope 100s, Olivetti Corp. TC 380s and Sanders Associates 390s. Some of these terminals operate on nonnetwork applications, with the 3270s and the 4014s connected to the IBM mainframes.

The company, a subsidiary of Mitsubishi Heavy Industry, uses a total of more than 150 terminals. The parent company owns 85% of Mitsubishi Motors, and Chrysler Corp. holds the other 15%, Arai said.

In addition to using both IBM and independent terminals, Arai uses a variety of modem equipment. In 1971, Japanese communications regulations were changed to allow the use of noncarrier modems. As a result, Mitsubishi now has data sets supplied by Racal-Milgo Corp., OKI, IBM, Toshiba Electronics and Nippon Telephone and Telegraph (NTT), the Japanese carrier.

The network includes several 96 Multimode 9,600 bit/-sec modems from Racal-Milgo because they have diagnostic capabilities that make it possible to isolate line malfunctions. Mitsubishi uses the split stream feature to derive two 4,800 bit/sec lines from a 9,600 bit/sec circuit, Arai explained.

Asked how he would characterize the quality of the network facilities supplied by NTT, Arai said it was improving but the company still had problems in some areas.

Terminal-to-CPU transmissions are at 1,200, 2,400 and 4,800 bit/sec on the network with some. CPU-to-CPU transfers run at 9,600 bit/sec. The network now runs with Binary Synchronous Communications protocol but an upgrade to IBM's Systems Network Architecture (SNA) with Synchronous Data Link Control will begin next May.

Arai estimated that it will take three years to convert the network to a full SNA environment. The system now runs with Tcam, IMS and TSO and the upgrade will include implementation of Vtam and NCP, he explained.

The move to SNA will mean higher costs because of the need for increased storage, but Arai believes that a reduction in terminals resulting from the increased efficiency of the network will make up for these higher costs.

Applications running on the Mitsubishi network include bill of materials processing, corporate production planning, accounting, shipping and, of course, automobile inventory.

One of the benefits Mitsubishi hopes to get from the SNA upgrade will be the capability to have 3270 CRTs communicate with multiple CPUs.

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A switchable white-on-black or black-on-white display, whichever your operator prefers. An easy-to-find cursor that frames the entire character position in a transparent, inverted video block.

Plus plenty of options you can't get with CRTs costing much more. Like our low-cost Pussycat page printer. A full range of foreign language character sets. We even have a model you can switch from ASCII to full overstrike APL.

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Only an industry leader like Perkin-Elmer could do it. We designed a powerful, custom LSI [illegible]roller chip that makes the [illegible]TAM the one and only high [illegible] CRT in its class. [illegible] for yourself. Use the [illegible]chart. Learn why [illegible] add this $599 [illegible] peripherals that [illegible]

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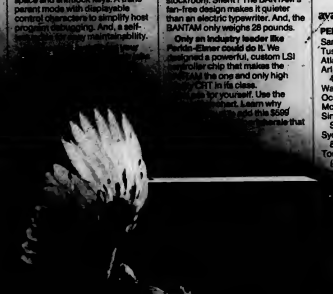

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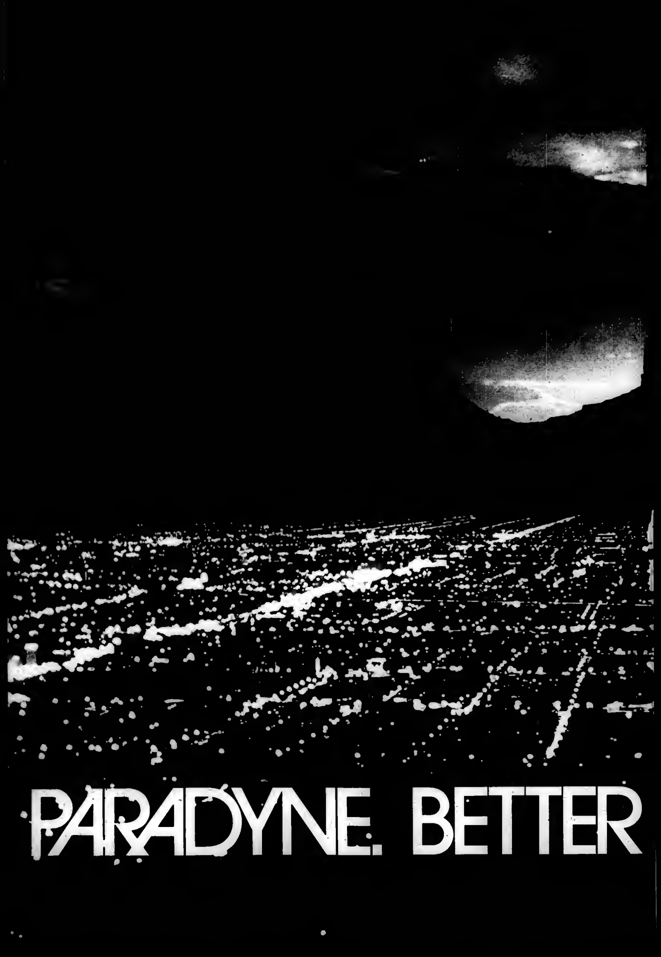
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Controller Suits Westinghouse Systems

COLUMBUS, Ohio — An asynchronous communications controller from Process Data Systems, Inc suits all Westinghouse Electric Corp. computer systems, including the Prodac P-50, P-250 and P-2000 series.

According to Process Data, Async/78 permits users to attach a wide variety of peripheral devices to a host CPU including color CRT terminals, floppy disk systems, cartridge tape systems, interprocessor data links, line printers and modems.

Async/78 is said to provide all hardware required for a single bidirectional, asynchronous serial communications controller and to support Bell models 103, 113 and 202 or equivalent full-duplex modems.

The Async/78 includes three bits of universal asynchronous receiver transmitter (Uart) receive status and three bits of modem status on every read. Also featured are three LED Uart status lights and three independent interrupts contained on the subsystem card.

Async/78 costs $1,950 with 90-day delivery, the vendor said from P.O. Box 14888, Columbus, Ohio 43214.

Graphics Capabilities Offered to 3277 Users

BEAVERTON, Ore. — Tektronix, Inc. has introduced a storage display monitor that enables IBM 3277 CRT users to add graphics display capability to their terminal systems.

The Tektronix 618 storage display monitor combined with the IBM 3277 graphics attachment (RPQ 7H0284) makes it possible to provide graphics output without any modification to existing software, a Tektronix spokeswoman said. The addition of the 618 results in a dual display capability, with the 3277 providing alphanumeric output and the 618 providing graphics.

The 618 does not interfere with normal operation of the 3277 CRT, Tektronix said.

The Model 618 is a 19-in. diagonal monitor driven as an X-Y-directed beam display using analog inputs. It offers high-resolution graphics such as that obtained with storage tubes with the added capability of displaying up to 1,000 vectors in write-through mode.

In write-through mode, refreshed data appears on the screen at the same time as stored graphics. This refresh portion of the display adds selective erase, interactivity and dynamic motion without any loss of resolution.

The front panel of the monitor has three control switches: Erase, which causes full screen erasure; View, which returns the display to bright "view mode," after it has automatically dropped into low-intensity "hold mode"; and Copy, which gives an 8-1/2-in. by 11-in. hard copy of the display when the optional 4631 hard-copy unit is attached to the Model 618.

Via the RPQ's RS-232C interface, full-color camera-ready output drawings are available on the 4662 (11-in. by 17-in.) interactive digital plotter or the 4663 (17-in. by 22-in.) interactive digital plotter.

The 618 display costs $8,700 or $348/mo on a three-year lease and first deliveries will be in March 1979.

The IBM RPQ costs $5,200, according to Tektronix. Software support includes basic routines for drawing lines and placing text and for coordinate transformation.

The Tektronix 4631 copy unit costs $4,395; the 4662, $4,195; and the 4663, $9,495. If no hard copy is required, only the 618 and IBM RPQ can be installed.

Tektronix can be reached through Box 500, Beaverton, Ore. 97077.

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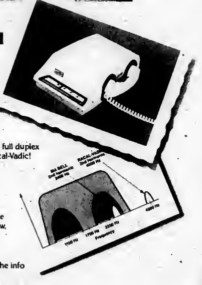
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This wise choice of frequencies has made possible a 1200 bps full duplex acoustic coupler—the VA3434, which is now in full production at Racal-Vadic!

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So Racal-Vadic has done it again, Ma. The real winners are remote terminal users who no longer have to settle for 300 bps operation. Now, merely by replacing their present coupler with the VA3434, they can operate at 1200 bps full duplex, while retaining the portability that an acoustic coupler provides.

Suggest that you phone or write Racal-Vadic today, Ma, for all the info on the VA3434 1200 bps full duplex acoustic coupler.

Your independent thinking son,

Alexander Graham Jr.

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Bank Goes On-Line, Anticipates EFT in Texas

Special to CW

SAN ANTONIO, Texas — Frost National Bank here has prepared for eventual authorization of electronic funds transfer (EFT) in Texas by upgrading its computational and data communications resources during the past year.

EFT for banks is effectively outlawed in Texas because the state constitution bars branch banking, and the U.S. Supreme Court has ruled that electronic banking machines are branch banks.

Frost has installed two IBM 370/158s and one IBM 370/138, implemented the IBM Check Processing Control System with two IBM 3890 reader/-sorters and set up three IBM System/3 minicomputers for distributed applications.

Further, the bank has developed a direct demand account (DDA) system, installed an on-line teller system and an IBM 3600 finance communications system.

Ultimate Acceptance

According to Frost's senior vice-president, Ken Trapp, "the short-term future for EFT in Texas is unpredictable, but its eventual acceptance is inevitable. Market surveys show that convenience is the single most important factor in a customer's choice of banks."

"Automated teller machines and point-of-sale terminals would give Texas bankers the tools we need to make banking as easy and convenient as possible for the customer," he observed.

Savings and loan institutions and credit unions are free to start branch operations and employ EFT, but Frost intends to undercut this competitive edge by using the recently acquired systems to process such information as transaction records until they also can be used to process money.

'Instant' Information

For example, the DDA system provides the bank's customers with a combined monthly statement that shows checking, savings, installment loan and bank card (Visa and Master Charge) balances.

The on-line teller system delivers "instant" DDA and savings information to the teller, with selected data about loan and bank card accounts. By the end of next year, Frost expects to have its installment loan and bank card files completely on-line.

Presently, 65 teller workstations at Frost and at its Kelley Air Force Base facility have access to the on-line DDA and savings files. At each workstation is an IBM 3604 teller terminal and an IBM 3610 printer, which replaced an old audio response and off-line teller system.

By keying in a brief inquiry transaction on the terminal, a teller can read the customer's name; available, current and collect balances; data and amount of last deposit; account status (open, closed or inactive); and a "yes" or "no" code on holds and stop payments.

A savings inquiry transaction will produce similar information on the customer's savings account. Information returns to the teller in four seconds, according to Susan Davenport, Frost administrative officer and supervisor of the paying and receiving tellers.

With the terminal, the teller can also record deposits and withdrawals (on a memo-posting basis), buy and sell Mexican pesos (important in a city with large trade volumes from Mexico) and accept bank card and loan payments, Davenpurt said.

Special messages displayed on the CRT guide the teller through each transaction and provide an alert for mistakes.

"The terminal will notify the teller if an account number is invalid, for instance," Davenport explained. "That means the error can be caught on the spot. The result is a lower number of rejected items each day."

The Model 3610 printer automatically validates DDA and savings receipts, provides bank card and loan payment receipts and records every transaction (including inquiries) on a daily log. The 3610 prints a sequence number, a teller identification number, the date, the time of day and the type and amount of the transaction on the customer's receipt and on the transaction log.

Terminals Linked to CPU

To help field customer telephone queries, Frost also installed several IBM 3270 CRT terminals in the bookkeeping, savings and bank card departments. The 3270s as well as the teller terminals are linked on-line to one of the Frost CPUs and yield average response times of 3- to 5 seconds.

Frost has established remote DP centers in Laredo, Corpus Christi and Houston, installing a System/3 at each site to better serve affiliates and correspondents.

Using the System/3 and a magnetic ink character recognition (Micr) reader/sorter to capture data, a remote bank — averaging about 30,000 accounts — transmits the entire day's work over phone lines to the main Frost computer center in about 15 minutes.

In a single day, Frost processes up to 700,000 data items. The IBM 3890 reader/sorters reportedly process 2,400 items/min compared with 1,600 items/min on the old machines. Further, the 3890s microfilm each item as it makes the first pass through the machine; this cuts operational costs.

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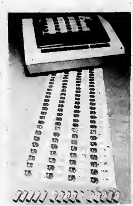

The firmware packages announced with three Dataroyal IPS-7000 printers enable users to change label and character types without extensive host computer reprogramming.

Printer Trio Suits POS

NASHUA, N.H. — Dataroyal Inc. has unveiled three printers for point-of-sale (POS) and other specialized applications that incorporate firmware said to minimize the amount of mainframe programming necessary to use the printers.

The firmware — programmable read-only memories (Prom) and random-access memories (RAM) — is bundled within the printers, but is available separately for Dataroyal printers already installed by users.

The three printers are part of the IPS-7000 family, which combines matrix printers running at speeds of 120- to 220 char./sec with 8-bit programmable microcomputers, according to a spokesman. The microcomputer architecture allows the performance characteristics of any model to be changed by replacing Prom chips, he said.

The three units introduced — the IPS-7223, the IPS-7226 and the IPS-7227 — are bidirectional printers that feature an IBM

(Continued on Page 54)

By Bell Labs Scientists

Vocal Access System Devised

By Howard A. Karten
CW Staff

MURRAY HILL, N.J. — Scientists at Bell Telephone Laboratories here have taken what they believe to be a major step in realizing the dream of direct vocal input to computers.

An experimental system devised by Bell Labs scientists is enabling telephone operators to retrieve telephone directory information by speaking the letters of a person's name directly into a computer. The system is far from commercially practical right now both in terms of economics and capabilities and requires the power of a computer to compensate for the imprecision in speech recognition.

However, the Bell scientists working on the project feel they have demonstrated the feasibility of the concept and work is continuing.

The significance of the system is fourfold: it uses general-purpose computers, relying heavily on software techniques and number-crunching to achieve recognition; it uses no special-purpose or exotic equipment beyond an analog-to-digital converter; its use is not limited to directory assistance and — perhaps most important — a user need not train the system to recognize his voice.

Spectral Analysis

It is the last point that is at the center of the system. To develop the system, scientists had 100 speakers read the letters of the alphabet, numbers and some command words into a microphone connected to an analog-to-digital converter. The digital output of the converter was subjected to extensive mathematical manipulations, and the 100 samples for each "word" were reduced to 12 representative "patterns."

"It's a sort of spectral analysis," Aaron Rosenberg of Bell Labs explained. "The digital numbers that result from the system's manipulations are characteristic of the spectrum of the signal within the sample."

However, he cautioned that this is a simplistic view and, in fact, the samples are analyzed and manipulated with sophisticated techniques such as matrix algebra.

The output of this technique — in the case of the letters of the alphabet 26 times 12 or 312 patterns — form a small data base that is used for comparison with the voice input. The actual voice input is itself sampled with an analog-to-digital converter and the converter's output is manipulated mathematically and used to search against the mini data base.

The idea of the search is not to come up with an exact match but rather a mathematical least distance figure that Rosenberg terms a best guess.

The computer guesses correctly about 80% of the time — [illegible] of voice input. The output of the recognizer is not a unique guess but a set of guesses, he said.

Those guesses are used to search against a telephone directory containing [illegible] 000 names. The directory assistance application was chosen since it requires the computer to recognize only a limited number of words, thereby increasing the system's accuracy, according to another

(Continued on Page 54)

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Steering Committees Aid User-DP Shop Interaction

By a CW Staff Writer

PENNSAUKEN, N.J. — To establish and maintain a cooperative working relationship between DP centers and their user organizations and to ensure that DP shops are providing the best service at the least cost, many centers are establishing a steering committee that represents both sides.

According to a recent issue of *Data Center Dialog*, a bimonthly issued by Auerbach Publishers, Inc., members of such a committee usually come from several departments, with a user — not a DP center representative — chairing the group. Since the committee is user-oriented, not data center-oriented, the publication noted, users can become involved in the DP center's day-to-day procedures.

In order to have the greatest impact, the committee should be made up of representatives from five areas: user departments, the internal auditing department, the controller's office, the applications programming department and the data center itself, the report said, adding, however, that it is unwise to overload the committee with user department representatives. That may dilute the focus of the group from user-

(Continued on Page 52)

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Floor Mat Cuts Static

ST. PAUL, Minn. — A static-control floor mat recently introduced by 3M Co. reportedly eliminates damage to computer equipment caused by operator-generated static electricity.

The Type 9100 static control floor mat drains static from a person's body before he contacts equipment, thus protecting him from shocks and eliminating such typical static-related problems as data loss, program charge and uncontrolled printer output, a spokesman said.

The mat is composed of four layers — a top conductive layer, a layer of conductive reinforcing fabric that provides the main discharge path through the mat to a ground cord terminal, an antifatigue operator comfort pad and a nonskid backing.

The mats, available in black, brown, gold and green, can be cleaned with water and detergent. They are flexible and can be cut to conform to surroundings, the spokesman added.

A 3- by 4-ft mat costs $91 and a 4- by 8-ft mat costs $169 in black and $228 in other colors, all in quantities of one to 24.

3M is at P.O. Box 33600, St. Paul, Minn. 55133.

Micrographics Considered Future Boon to Managers

SYDNEY, Australia — Daily reports filmed from paper and computer tape sources can now be transmitted to desk screens anywhere in the world, a micrographics industry expert recently told the Australasian Micrographics Congress and Exhibition here.

"The leading edge of micrographics technology is far beyond the archival records storage stage that most people still remember," according to Sam Greene, president of Terminal Data International Sales Corp. and vice-president of its parent company, Terminal Data Corp. (TDC) of Woodland Hills, Calif.

"The majority of business executives still visualize micrographics as a technique for storing old data on film. But in the more sophisticated 'offices of the future,' micrographics is offering business and government a new approach to information management," Greene told a group of micrographics managers and business executives.

"Technology is moving at a rapid pace. For example, visualize a micrographics/digital reader and a keyboard in a desk. This device allows an individual to key-in a specific document desired. A message is then sent to a records management center, which is controlled by a central micrographics/-computer system.

"With this technology, a mix of micrographic and digital data is transmitted hundreds or thousands of miles to the individuals's desk screen.

"This is but one in a range of technologies that establish microforms — both microfilm and postcard-size 'microfiche — as viable data management tools. One of the most important new technologies is the interfacing of micrographics with computers [to create] systems in which all aspects of document storage and retrieval can be computer-controlled," he added.

"While computers can store millions of bits of information, they are very expensive to use as printing presses.

"In the last few years private industry, commercial publishers and government agencies all recognized that information could be produced faster and more economically on microfilm. But the true test of the overall savings was found in the intrinsic nature of the medium itself: microfilm is inexpensive to mail, store, maintain and retrieve. Accordingly, the end user benefits with more up-to-date information at less cost," Greene said.

Future Acceptance

Greene predicted the use of the computer as an aid in information retrieval will spur the future acceptance of micropublishing through automatic indexing and assisting retrieval. As an example, he pointed to Digital Equipment Corp. and its use of computer output microfilm (COM) systems and high-speed multiformat document cameras produced by TDC.

"What role does computer technology play at TDC? Primarily through microprocessors, computers make filming systems more efficient with automatic indexing and titling. They also speed up the task and cut costs because of higher filming rates," he added.

Greene also pointed to the U.S. Patent Office, which had been using manual search procedures and recently installed a computer-controlled microform search system for identifying and locating the necessary files.

"Patent examiners tell me that it takes an average of eight to nine hours to search a patent using the manual "shoe-box" method. Using a computer-micrographics system, the search takes less than one-third of the time," Greene explained.

"There is no doubt that merging computers with micrographics is resulting in an accelerated technology," he concluded.

More Than Dandelion Wine

Weeds Sprout Up as Aid in Crop Studies

Special to CW

BELTSVILLE, Md. — Weeds are odious plant pests that we should all strive to eliminate, right?

Wrong.

Not only do some weeds have important medicinal uses, but data about them, stored in a U.S. Department of Agriculture (USDA) computer here, has implications for medical research, foreign policy, food policy and other areas as well.

Botanists from the USDA Medicinal Plant Resources Laboratory use the Agricultural, Ecological and Geographical Information System (Aegis) to store and manipulate data on worldwide weed types, relative humidity, fertilization and other factors and to recommend crop possibilities for remote areas of the world.

Dr. James Duke, director of the plant lab, said the program was begun several years ago in cooperation with the State Department in an attempt to find profitable alternative crops for countries that were primarily narcotics producers.

"It all took off from our efforts to find economical crops for a few underdeveloped countries that were surviving on the drug traffic," Duke said. "Later, we realized that we could share the data with farmers all over the world.

"Aegis is now helping to feed the world's people by enabling regions, sometimes for the first time, to grow food in marginal environments and to get greater yields from lands already being used."

The plant lab has accumulated about 100,000 records on environmental factors — including rainfall, soil pH and growing seasons — that affect the growth of more than 300,000 types of plants throughout the world. The records are stored in a crop information system that is based on an IBM 370/168.

When a region's climate ur other key environmental factors are input, Aegis can match up what has been successfully grown under the same conditions in other world regions.

Positive Values

The botanists found that in some foreign regions, the weed varieties were the only existing vegetation, but weeds are an excellent indicator of a region's climate and soil conditions, accurding to Duke.

"Weeds themselves have certain positive values for man, which we're just beginning to fully realize," he said. "For instance, some have been suggested as energy sources when the oil wells run dry. Just as important, when we look at all the weeds that grow in a region, we can make predictions about the crops that will best grow there."

In some instances, weeds and the best places to grow them are actually what the botanists are looking for, Duke added.

The plant lab has collaborated with the National Institutes of Health (NIH) to procure and record information on some 30,000 varieties of plants, including weeds, for cancer research.

"If NIH discovers that a certain strain of weed is crucial in a drug treatment of cancer, it may need large crops of it. We'll be able to turn to Aegis and immediately determine where in the world that weed will grow best," Duke noted.

Insurance Policy

Whether a crop is needed to feed people or to cure cancer, the data bank will be a good insurance policy, Duke continued, because "if one country that is a big producer of a crop becomes politically alienated and cuts off our supply, we'll know where else in the world we can grow the crop. We no longer have to rely on trial and error."

When word of the data bank got out, Duke said, requests started coming in daily from many parts of the world, seeking advice on crops to grow in wastelands.

"Of course, we can't tell them which crops will rid them of poverty. We can recommend which plants will grow in their environment, then it is up to the econumists to say which crop will be most profitable," he added.

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Data Entry Managers Warned of Future Stress

By Howard A. Karten
CW Staff

SAN DIEGO — Data entry managers in the next three to five years will face four main sources of stress: rapid change, organizational realignment, managerial shortages and increased specialization.

To succeed at their jobs, these managers must recognize that they may experience some emotional and physical distress in the course of change but that the end result will be improved operations, according to William G. Moore Jr., president and chief operating officer of Infoton, Inc., the Boston-based manufacturer of CRT terminals.

In his keynote address at a recent conference here, Moore said these rapidly occurring changes will be beneficial to managers only insofar as they provide growth. "If the effect of rapid technological and organizational change in data entry is the obsolescence of skills, then change [will have] been destructive. But as the work environment changes, data entry managers must change, too."

Armed with this awareness of change, managers will not only be able to cope with it but will enjoy it as well, Moore suggested. For example, they should realize that the changing world and definition of data entry will offer "significantly expanded" job opportunities in the future.

To bolster this argument, the company president pointed to the fact that the title "data entry manager" was virtually nonexistent in the early 1970s.

"There will be new titles and higher slots on virtually every company's organizational chart. Who will run the office of the future? Who will pioneer the concept of electronic mail? Who will oversee the processing nodes within a distributed network?" Moore asked. These are really questions without answers, he implied, since "the data entry and DP wave of the '80s will create more good jobs than there are people to fill them."

In addition, data entry managers should be aware that the move to terminal-based systems will be a very positive one, since it will put a premium on skills that most of these managers already possess. Therefore, Moore cautioned, data entry managers should stop selling themselves short.

They "really haven't taken the time to stop and think about how really well off [they] are." Few have tried to catalog, much less aggressively promote, the many skills they have acquired over the years, he continued.

For starters, he noted, data entry managers generally are familiar with the language of the computer industry. Many of them have grown up with DP and are no longer in awe of it. "But can those who have parachuted into the DP industry at some point within the last 10 to 15 years remember how apprehensive they were about all the new terms, abbreviations, numerical designations and the like?

Most data entry managers know more about systems analysis than they might think — they are comfortable with flowcharts, data concepts such as files and records and some concepts of human factors engineering, he noted. For ex-

(Continued on Page 52)

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Eight-Step Process Described

Book Outlines Approach to DP Power Problem

By a CW Staff Writer

NEWTON, Mass. — The electrical problems associated with running a data center — brownouts, blackouts, and spikes, for example — are unlikely to go away in the near future, which means managers must be prepared to deal effectively with them.

Managing a study of the power situation with the aim of solving these problems is an eight-step process, according to a recent book on the subject.

Computer Failure and Energy Shortages, by Henry H. Petersohn, recommends that a study begin with establishing the parameters of the problem. For example, are the computers the only equipment affected by the power problems, or is other equipment also affected? Can the computer failures be related to other users of power in the building?

The person or team designated to study the problem must determine limits which should be stated as clearly and precisely as possible," according to Petersohn.

Following this, an "engineering diagnosis" should be done to verify the parameters. The aim is to learn the "real" cause of the problems.

For example, a computer failure does not, in itself, indicate the source or cause of the problem, Petersohn noted. To find the root cause, a more technical study may be necessary, such as monitoring the power to find transients, spikes, and other electrical anomalies.

Local power company personnel can be useful in determining the origin of these "glitches," according to the book. But the monitoring and consulting may have to be stretched out for a period of weeks to obtain a good sample size.

Cost/Benefit Analysis

Following the engineering diagnosis, a detailed cost/benefit analysis should be prepared for management, the author continued. "It is important to determine economic costs, not just accounting costs."

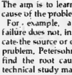
For example, the book stated that computer center supervisors "will probably not receive overtime pay" for the extra hours they must work because of the power failure. "Each failure must be appraised separately to determine what tangible and intangible losses may have occurred and must be considered," the author noted.

Next, engineering ideas should be requested for possible solutions. For example, the author noted, "Providing 100% protection for all the electrical needs of the computer center is much more costly than providing complete protection for the highly critical equipment only and moderate protection for the less critical equipment and related needs."

After learning of alternative solutions, management should authorize a revision of the initial cost/benefit analysis, the author said. The revsiion should include more accurate data and should indicate the preferred solution.

According to Petersohn, the last two steps in the study should be to commission a formal engineering plan to implement the solution and to get management's decision based on its review of the study. This involves considering the proposals, the least costly solution, the quickest implementation and the easiest expansion of the plan.

Computer Failure and Energy Shortages is published by The Technology Press, Inc., Box 125, Fairfax Station, Va. 22039.



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On-Line System Cuts Insurer's Paper Burden

By Frank Montgomery
And Hae Soo Whang
Special to CW

NEW YORK — The National Health and Welfare Retirement Association (NHWRA), the only organization in the U.S. that underwrites employee benefit programs exclusively for nonprofit, community service organizations, has improved its customer service through a major mainframe upgrade and a switch to on-line capabilities.

"Even though our clients are small, nonprofit organisations, they expect a kind of pension service as advanced as anything available in the industry," according to Howard H. Hennington, NHWRA executive vice-president and chief actuary.

NHWRA, a nonprofit company, serves more than 3,600 employer clients in 50 states. It designs the plans for the required actuarial services, invests the funds paid in, performs monthly billing and accounting and calculates and pays benefits.

Elaborate records are kept, covering more than 150,000 participants and providing each one with an annual statement that details the status of his pension account. In addition, the company assists clients in meeting their reporting responsibilities under the 1974 Employee Retirement Income Security Act (Ersa).

The company also sells long-term disability income and death benefits and, together with a subsidiary, ranks in the top 4% of insurance companies in this country. Its current investment portfolio is more than $320 million.

Because of its size, the quality of the pension technology offered must be matched with a comparable service technology. That means, of course, having an up-to-date computer capability.

Improvements Made

The firm uses an IBM 370/138 running under DOS/VS. The recently installed 512K-byte system replaces a 360/30 that was used since 1970. Making this replacement enabled the firm to further improve the system.

An on-line system, running under CICS was added. It has eliminated a lot of paperwork and paperwork-generated delays, particularly when information in a client's account must be updated. Information can now be updated within a day, as opposed to the occasional delays of more than a month with the previous system.

One problem particular to pension systems involves time spans: There are both long pay-in and pay-out periods. With these kinds of time spans, any improvement in the timeliness and accuracy of records means a reduction of costs. The need for timeliness and the increased capacity of the system has allowed the firm to shift its work more and more to a daily mode of operation.

For example, by processing incoming funds into the system on the day of receipt, it will be possible to calculate the share value of NHWRA's common stock account daily instead of monthly.

On-Line Inquiry

Another valuable feature of the system is on-line inquiry. A clerk can access any data needed by entering the individual's Social Security number on an IBM 3277 CRT.

The on-line capability is also proving a boon internally, through CICS Source Program Maintenance On-line II (SPM). This productivity aid extends the power of a CICS on-line system to programmers and problem-solving end users. It stores source programs and data on disk, retrieving them, working on them in conversational mode at a terminal and submitting them to the computer for immediate testing.

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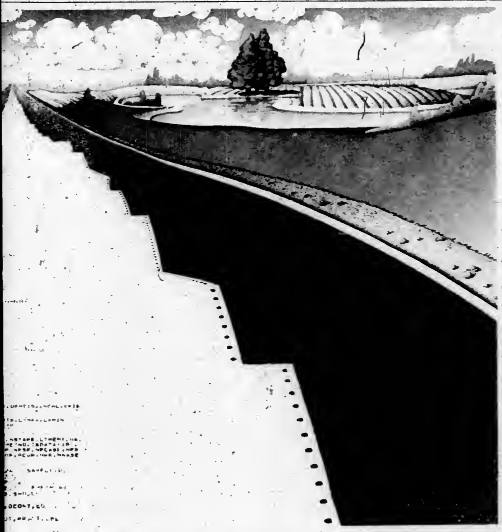
(Continued on Page 54)



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Heat From DP Systems Warms School Buildings

By a CW Staff Writer

BALTIMORE — Power, energy and money are three things that are very much on the minds of DP operations managers these days. Facilities engineers at Johns Hopkins University's Applied Physics Laboratory are managing to save all three with a device called a heat pump.

The lab uses several DP systems, the biggest of which is a water-cooled IBM 360/91. Running these systems and their peripherals creates a lot of heat that was formerly wasted, according to Arthur C. Stucki, plant engineering supervisor for the university.

"The heat rejected from this computer building, even in the coldest weather, was around one million BTU/hour. The hot water in the air conditioning system was rejected into a cooling tower complex that also served the normal air conditioning needs of the building," Stucki noted.

So much heat was lost to the atmosphere through the tower, according to Richard T. Ellis, supervisor of engineering facilities at Hopkins, that "on a cold winter day, you could look at the cooling tower and see all that heat coming out [in the form of water vapor]. You could go out of your mind looking at the waste.

"When the energy crunch occurred we immediately started looking for ways to save energy. In particular, we knew we could recycle some of the heat from the computers."

How to Do It?

The question on the minds of everyone at the lab, Ellis continued, was "How are we going to get that heat back?"

The heat is not directly usable, he noted, because it is "low-grade — it isn't hot enough to use as it comes from the tower. University personnel immediately thought of a high-temperature heat pump to extract the hotter temperatures from air or water. Such a pump produces more heat energy than is required to operate it.

The school's plant personnel considered designing the device themselves. However, they found that Westinghouse Electric Corp. manufactures the device they needed. They bought the Westinghouse Templifier or temperature amplifier, for $27 000 and spent an additional $20,000 to install it.

Savings of $10,000

"The unit works just the way it's advertised — it's a very good machine," Ellis said of the unit's operation. In addition to the $47,000 purchase and installation cost, the Templifier uses approximately $6,000 in electricity during the year.

However, Ellis estimated that by using the device, the school avoids burning roughly 40,000 gallons of oil per year, saving $16,000 this year. This results in a net savings of $10,000 per year, so "the unit will pay for itself in five years," he predicted.

"We're able to shut down the boilers most of the time, using this system," he added. However, Ellis and his department are aware of the need for backup, so they are not abandoning the oil burner altogether.

There's nothing magical about all this, Ellis indicated. Modern buildings — particularly with DP equipment running in so many offices — "tend to be hot in the core while the perimeter tends to be too cold, because that's where the heat escapes." By using the heat pump, the heat is redistributed.

Steering Committees Aid Sites

(Continued from Page 47)

all concerns to more detailed operations of the data center itself.

Including representatives of the internal auditing department is useful in anticipating possible problems rather than reacting to them later. And, on a practical basis, the involvement of the controller's department can help in soliciting funds for ongoing and special projects, the report stated.

Some Drawbacks

However, there are also negative aspects to this setup, Auerbach noted. "The most obvious danger posed by a steering committee is that it can exert [control] over the data center operations manager." The operations manager can become a "slave to the committee's demands for information" if the committee's power over him is not limited, the report said.

For example, although the operations manager provides information to the committee, he can become "a victim of [its] requests for information and lose control over areas of responsibility by having to defend [all of his decisions] to the committee," according to the report.

An additional — and highly relevant — disadvantage may arise if the operations manager's performance is scrutinized too closely by the committee representatives, the report added: They might take advantage of their power, placing the manager at a disadvantage.

However, the positive effects a steering committe, can have make the idea well worthy considering, Auerbach concluded. These effects fall into two main areas: "encouraging users to project future DP requirements," thus helping in data center planning, and "obtaining support from many critical company departments" for various aspects of DP, such as data security and work-load leveling.

"Although steering committees can have their faults, they are still one of the best ways of promoting and maintaining high-quality and cost-effective DP," the report said.

Data Center Dialog is published by Auerbach Publishers, Inc., 6560 N. Park Drive, Pennsauken, N.J. 08109.

Data Entry Management Warned of Stress Ahead

(Continued from Page 49)

ample, most people heavily involved in the filed "understand the relationship between a human being and a machine — for example, what makes for a good screen layout or a poor one, or how a keyboard should be arranged to reduce fatigue and increase productivity."

Asset for Future

Data entry personnel should realize that not only do they know a lot about DP, but that that knowledge will prove valuable in the future as DP tackles applications that would have seemed insurmountable only a few years ago.

"As we have learned to appreciate from our experience, the limits to positive change and increased productivity are seldum technology-related. The technology is there, but it is the quality of management — those who must make things happen — that so often retards progress," Moore continued. Data entry managers will be among those who will be "the principal architects of change and progress," he said.

The advancing technology of data handling will almost certainly open up several new areas including text editing, electronic mail and developments in miniaturized, hand-held data entry devices, Moore added. Further, voice input, for those unique applications requiring hands-free operations, will be more important in data capture.

And even more spectacularly, visually aided, general-purpose robots will be commonly used for some of the repetitive tasks now performed by humans, he forecast, noting that these robots will require supervision.

Citing estimates that less than 20% of all potential computer applications have yet been put into operation, Moore concluded that the challenge in years to come is to prepare for a "professional bonanza."

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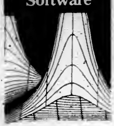
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(a) a remote information system we first introduced in 1978.
(b) a distributed data processing product.
(c) a multifunction data processing product.

2. Its features include:

(a) multitasking for up to four applications.
(b) large disk capacity.
(c) modular configuration.
(d) more than these.

3. New improvements are:

(a) increased processor memory to 256K bytes.
(b) the addition of remote workstations and printers.
(c) increased disk storage to 100 MB.

4. Model 85 functions are:

(a) remote file management and high level language processing.
(b) on line file management and stand-alone processing.
(c) batch communications and volume data entry.

5. Available languages are:

(a) RPG II.
(b) COBOL.
(c) ESPERANTO.

6. Model 85 saves users money as an alternative to:

(a) enlarging mainframes overburdened by network interactive applications.
(b) adding communications lines with greater capacities.
(c) maintaining a mainframe configuration only fully used at peak time periods.
(d) losing time and money due to mainframe downtime.

7. For more details on Model 85, you should:

(a) phone your nearest Data 100 sales office or one of the numbers we've listed.

Now check your answers.

All answers but these three are correct.

2a Model 85 offers multitasking for up to *eight* applications.
3c 100 MB is old figure. Model 85 is now *245.6 MB* disk storage.
5c No. Model 85 doesn't speak it. Yet.

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Coastal Data Unveils Data Collection Device

MIAMI — Coastal Data Services Inc. has introduced an on-line data collection device that reportedly records payroll job costing labor distribution and inventory information as well as employee location and security-access statistics.

Smart Clock contains up to 4K words of programmable read-only memory (Prom) and up to 16,000 characters of random-access memory (RAM), a spokesman stated. The 16-lb unit is RS-232C-compatible and can be optionally fitted to accept 20mA current loop interfaces or 600 bit/sec modems.

The unit operates in a real-time or batch mode and can collect and edit data via badges punched cards built-in keyboard entries or transmissions from other terminals the spokesman continued. Valid data is verified, manipulated stored or transmitted by the Smart Clock and can be displayed on a built-in four-digit LED screen.

In addition the unit can be used to monitor the progress of various jobs by keeping track of each completed step, the spokesman claimed. The state of completion of each job or product the number of items completing each manufacturing step and the time required to complete each step can be recorded via the clock and can either be stored in the unit or relayed to another site.

The Smart Clock costs $2,500 with an additional $125 for each 2K of RAM. The device can be leased for $60/mo with an added $1/mo for each 2K of RAM. Support and maintenance packages cost $12/mo extra, the spokesman said. From 1592 N.W. 159 St. Miami Fla. 33169.

System Cuts Insurer's Paperwork

(Continued from Page 51)

ulate sets of card image statements without having to handle punch cards.

Former Frustrations

"When we used batch mode, a programmer was normally limited to two shots a day on the computer" according to Peter Rennick, a department project manager. "It was extremely frustrating to waste a shot because of the kind of trivial mistake that is almost inevitable in programming. Now, a programmer sits down at a terminal, manipulates his card images with the keyboard until he has what he wants and gives that job to the computer for a test run.

"He immediatey sees the results at the terminal. If he finds he has made a mistake, he corrects it on the spot. Instead of two shots a day, he can get five or six within a few minutes and get the job done," Rennick said.

One advantage SPM offers, Rennick noted, is that it enables a programmer to work continuously at a single problem, while all parts of it are fresh in his mind.

Since SPM is basically a system for manipulating card images and submitting them to a computer, production personnel are also using it in lieu of job control cards to submit each night's work to the computer. By storing the cards in the terminal and manipulating them through SPM, operations clerks can make the special modifications for each night's run more accurately than they could with the cards.

Card malfunctions connected with human error or oversight are eliminated, and overall it is possible to maintain a much higher degree of integrity.

Avoids Dissociation

Another payback from the on-line investment is what the firm calls "the improved psychological health and morale of our clerical work force." This is no small dividend.

It is clear that for most clerks the consequence of working in the normal batch mode leaves a sense of dissociation from the task. On the other hand, when the clerk is given a terminal and control of the task, the work is more rewarding.

The batch mode procedure of start, stop and wait provides a frustrating climate for work. On-line operations have reduced errors because basically, given the immediate opportunity, a person will correct his own errors: People really want to do perfect work, and the immediate feedback provided in the on-line environment encourages that.

The job satisfaction generated by the on-line capability should directly affect the quality of work people do and therefore the quality of the data.

Montgomery is vice-president for Special Projects with NHWRA. Whang is vice-president for Systems with the company.

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Vocal Access System Developed

(Continued from Page 47)

Bell spokesman.

When the system fails to find a name in the directory, it assumes it has made an error and looks for the next most likely name. Although the accuracy of the speech recognizer is only 80%, this trial-and-error approach enables the system to come up with the correct name and phone number about 97% of the time, the spokesman said.

"I think I have demonstrated the feasibility of the system, but it requires a lot of qualifying," Rosenberg said. More resources — mainly time and money — will be required if the system is ever to be ready for everyday commercial use, he indicated.

Potential Applications

Rosenberg cited three potential applications for the system: it could allow users to access or control a remote processor; it would let airline pilots or others interact with a computer while keeping their hands and eyes elsewhere; and it would permit direct, remote inquiry of a large data base.

"You could control a computer over telephone lines, eliminating the need for modems, dedicated lines (particularly broadband lines) and other equipment," Rosenberg suggested.

In another application, a user could query a data base, such as an airline schedule, without an intermediary. Voice response from the computer — already a proven, if limited, technology — could provide the output.

But one of the key problems, as with many computer applications, is overcoming the human-machine interface problems. The system has some very real limitations, Rosenberg noted. For one thing, it can't understand speech impediments or many foreign accents.

In addition, it lacks abilities humans take for granted: the ability to filter out extraneous noise, such as office background noise, gum-chewing sounds and the "ohs" and "ahs" that mark human speech, and the ability to discriminate the end of one word and the beginning of another.

"But the more subtle thing is, how well would people interact with it?" Rosenberg asked. "Will the general population of speakers interact well with the system?

"My feeling, at least now, is probably not, because it requires a rather disciplined mode of speaking."

Considering how fast technology has been advancing in the past five years, however, commercial use of the system might not be so far off.

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Dataroyal Printer Trio Suits POS Applications

(Continued from Page 47)

2848-compatible serial interface and a 200-character (double-line) buffer. Other serial interfaces are available, the spokesman noted.

The IPS-7223 and IPS-7226 print a 64-character Ascii set in a 5 by 7 dot matrix at speeds of 120- and 150 char./sec, respectively. The IPS-7227 prints a 45-character Ascii set in a 3 by 7 matrix that is especially suitable for shelf labeling, according to Dataroyal.

Additional features include an audible alarm to alert operators to problem conditions and a self-test switch to aid in fault diagnosis.

In addition, the IPS-7223 offers operator-selectable vertical printing at 6- or 9 line/in., while the 7226 and 7227 offer either 6 or 10 line/in. Programmable vertical format control is available on all three models.

In single-unit quantities, the IPS-7223 costs $2,260 for OEMs and $3,050 for end users. The IPS-7226 and the IPS-7227 are priced at $2,800 for OEMs and $3,455 for end users, also in single quantities, Dataroyal said from Main Dunstable Road, Nashua, N.H. 03060.

Hewlett-Packard

Computer Advances

Vol.4 No.1 Jan./Feb. 1979

Silicon-on-Sapphire
in the HP 300 and
the HP 3000 Series 33

HP300: The small computer grows up

Continuing the tradition of bringing customers more computer power for less money and in less space, Hewlett-Packard recently introduced another in its series of computers for business data processing. The HP300—a brand new kind of computer—blends the gains of SOS technology with a philosophy that powerful computers don't have to be difficult to use or costly to own.

Silicon-on-sapphire

Key to the unprecedented power and compactness of the HP300 business computer system is an overall infusion of SOS technology. There are a total of six different HP SOS chip designs in the HP300—the most impressive being that of the processor. Ninety per cent of the HP300's CPU logic and circuitry has been condensed to fit on three CMOS/SOS chips.

Beyond density and compactness, SOS advantages include speed, reliability and low power requirements. In fact, the HP300 operates from a standard wall outlet.

The operating system is called Amigo/300—which gives a clue to the HP300's personality. Its features (as listed in the subheads) attest to its power. Until now, these capabilities have been available only on large, expensive systems.

Multiprogramming/ multitasking

With the HP300, different and independent programs and system utilities can execute concurrently with program development. In other words, the HP300 can be used interactively even while printing reports, processing transactions, sorting files, or gathering data from up to 16 on-line terminals. Furthermore, any single-program can have control of many independently processing "tasks," each performing its own function within the program and executing in parallel with the others.

Priority scheduling

Processor and memory resources are scheduled for rapid servicing of I/O requests on a task-by-task priority basis. The processor supports up to 256 priority levels.

When necessary, operator intervention enables the HP300 to reflect the unexpected demands of the business environment. By pressing an "ATTENTION" key, a user can gain control of the screen and keyboard to satisfy an important request while the other activities continue to run.

Virtual memory

Up to one million bytes of error correcting, 16K RAM semiconductor memory can be packed into the HP300.

But, program size is not confined to this internal memory thanks to the HP300's advanced virtual memory scheme. With this approach, only a small portion of a program is required in main memory at any one time, while the rest remains out on disc. A demand segmentation scheme, together with an analysis of past program behavior, determines which segment should be swapped in from disc. Memory utilization is further optimized for both code and data are segmented.

Data management

The HP300 features a full data base management system, IMAGE/300, and a file management system of six different file structures including keyed sequential.

Two business languages

The HP300 has an enhanced version of business BASIC and RPG II. BASIC features advanced capabilities including full access to all system services. RPG II includes a multiterminal data entry utility that allows batch oriented RPG programs to be easily converted for multiterminal data entry.

Growth potential

The HP300 was planned for growth. You can begin with a minimal, single user system and expand to up to 16 on-line terminals. The system can be further extended with additional disc storage and multiple printers.

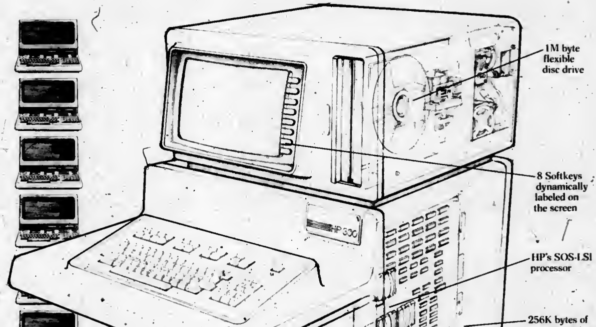
The HP300 starts at $36,500.* OEM discounts are available.

Indicate A on the reply card for further information.

◀ *Cover*

A dramatic representation of the complexity and density of circuits and layers found in HP's new Silicon-on-Sapphire chips.

**U.S. domestic price*


1M byte flexible disc drive
8 Softkeys dynamically labeled on the screen
HP's SOS-LSI processor
256K bytes of error-correcting memory; expandable to 1024K bytes
12M byte fixed disc drive
HP 300

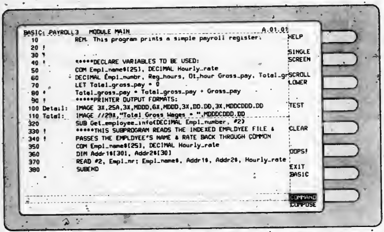
As powerful as it is compact, the new HP300 computer system with its SOS technology was designed to simplify the development and control of on-line business data processing applications.

HP300

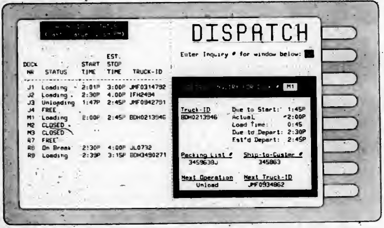
...and displays its power

The HP300 was designed to ensure one department full control of on-line, dedicated, data processing applications. Programs control and gather data from up to 16 on-line transaction processing terminals. These terminals function in response to the controlling demands of the application programs or the HP300 console.

All of the system's capabilities are accessible through an innovative, microprocessor-based Integrated Display System (IDS). This screen/keyboard combination is the part of the system with which you interact and will most probably enjoy, for the way it works spoils you immeasureably. Through pushbutton controls and advanced display and editing functions, the IDS gives you direct control over all aspects of HP300 operation.



```
BASIC: PAYROLL3   MODULE MAIN                                      A.01.01
  10          REM. This program prints a simple payroll register.
  20 !
  30 !
  40 !        *****DECLARE VARIABLES TO BE USED:
  50          COM Empl_name$[25], DECIMAL Hourly_rate
  60          DECIMAL Empl_numbr, Reg_hours, Ot_hour Gross_pay, Total_gr
  70          LET Total_gross_pay = 0
  80 !        Total_gross_pay = Total_gross_pay + Gross_pay
  90 !        *****PRINTER OUTPUT FORMATS:
 100 Detail:  IMAGE 3X,25A,3X,MDDD,6X,MDDD,3X,DD.DD,3X,MDDCDDD.DD
 110 Total:   IMAGE //29X,"Total Gross Wages = ",MDDDCDDD.DD
 320          SUB Get_employee_info(DECIMAL Empl_number, #2)
 330 !        *****THIS SUBPROGRAM READS THE INDEXED EMPLOYEE FILE &
 340 !        PASSES THE EMPLOYEE'S NAME & RATE BACK THROUGH COMMON
 350          COM Empl_name$[25], DECIMAL Hourly_rate
 360          DIM Addr1$[30], Addr2$[30]
 370          READ #2, Empl_nr; Empl_name$, Addr1$, Addr2$, Hourly_rate
 380          SUBEND
```



```
                                    DISPATCH

                                    Enter Inquiry # for window below:
                    EST.
DOCK          START STOP
 NR  STATUS   TIME  TIME  TRUCK-ID
 J1  Loading   2:01P 3:00P JMF0314792
 J2  Loading   2:30P 4.00P IFH2494
 J3  Unloading 1:47P 2:45P JMF0942791
 J4  FREE
 M1  Loading   2:00P 2:45P BDH0213946
 M2  CLOSED
 M3  CLOSED
 R7  FREE
 R8  On Break  2:30P 4:00P JL0732
 R9  Loading   2:39P 3:15P BDH3490271

                                    M1
                                    Truck-ID      Due to Start:   1:45P
                                    BDH0213946    Actual          2:00P
                                                  Load Time:      0:45
                                                  Due to Depart:  2:30P
                                                  Est'd Depart:   2:45P

                                    Packing List #   Ship-to-Custmr #
                                      3459638J          345863

                                    Next Operation   Next Truck-ID
                                       Unload          JMF0934862
```

The IDS can be used in multiple ways. The first screen shows its role in the programming process. Advanced IDS features simplify program entry, editing and testing, making BASIC programming a much more efficient and enjoyable process. In this example, the <u>*split screen*</u> *capability is used to compare two separate parts of a program by viewing them simultaneously. The second screen shows the IDS in a real-time application where the* <u>*windowing*</u> *capability enables presentation of information from various sources in a straight-forward way. This is frequently a requirement in complex inquiry applications.*

Innovative programming

All programs pass through several stages before they are executable: text editing, compilation, segmentation, linking, etc. Traditionally, a programmer needs to know not only each of these intermediate forms, but also how to invoke processing at each stage.

To avoid these obstacles which interrupt thought and work flow, the HP300 takes an innovative approach to software development. By simply depressing the "TEST" key, the system automatically does what is needed to get your program running. It appears to you that the system directly "understands" BASIC or RPG.

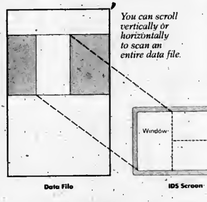
With this homogeneous approach, the programmer works through one common interface and not a confusing collection of different commands. Even RPG II is simple and interactive. Programmers need not be concerned with the usual inconveniences associated with coding sheets—column counting and justification, and delayed error correction.

The result of the HP300's innovative IDS approach to programming is a dramatic shortening of the time it takes to design and develop sophisticated application programs. Debugging, usually the most difficult and tedious aspect of the cycle, is particularly shortened thanks to the IDS. And since the resulting code is fully compiled, there is no loss of efficiency in the execution environment.

The HP300 features an innovative and easy single-step start up. Power on, and the system automatically comes up. The addition of new peripherals or memory is accomplished through a program which guides the user and relies heavily upon softkey menus. This ease of configuration is a salient contribution of the HP300.

Windowing

The IDS can also be used to display and control various aspects of one or more applications. Its display screen can be split into as many as 8 individually controlled and functioning mini displays, each with its own input and output capabilities. Moreover, any one window can be "attached" to a data file and scrolled, both horizontally as well as vertically. Thus, each window can display information that may be up to 160 columns wide and as long as your longest file. The usefulness of this innovative feature as an application design tool can expand with the imagination of a programmer.



You can scroll vertically or horizontally to scan an entire data file.

An interesting aspect of the IDS approach is its eight special function softkeys that can be programmatically defined and dynamically labeled and relabeled in an adjacent area of the screen. The softkey "HELP" invokes a most useful capability. This interactive facility attempts to answer conversational questions entered at the IDS. Plus, "HELP" gives you on-line access to the documentation which conveys general information about system operation and commands.

Display enhancements

Just like HP's 2640 family terminals, the IDS screen has upper and lower case characters, inverse video, half-bright, blinking, and underlining. A line drawing set, large characters, or math symbols are available options.

Used in combination, the softkeys, windows, scrolling, and screen display enhancements can create a lively, interactive, push key, menu selection environment. A user is conveniently guided through what might otherwise be a complex interaction. In applications, the screen literally comes alive with the guiding interplay of windows and softkeys. Only a live demo can bring this concept to reality for you. We'd be happy to arrange one. **Just request a contact on the reply card.**

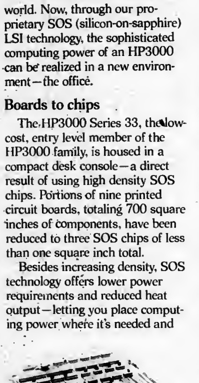
Small is powerful: An HP3000 in a desk

Over 2000 Hewlett-Packard 3000s are currently hard at work in remote or centralized commercial data centers scattered around the world. Now, through our proprietary SOS (silicon-on-sapphire) LSI technology, the sophisticated computing power of an HP3000 can be realized in a new environment—the office.

Boards to chips

The HP3000 Series 33, the low-cost, entry level member of the HP3000 family, is housed in a compact desk console—a direct result of using high density SOS chips. Portions of nine printed circuit boards, totaling 700 square inches of components, have been reduced to three SOS chips of less than one square inch total.

Besides increasing density, SOS technology offers lower power requirements and reduced heat output—letting you place computing power where it's needed and with little site preparation. The Series 33 requires no special powerlines or computer room. Little or no additional air conditioning is needed.



HP's high density SOS technology reduced the 700 square inches of HP3000 components on portions of nine PC boards to three SOS chips. Results? Big computing power in a small package.

Performance tested

Like all HP3000 computer systems, the Series 33's ability to effectively handle on-line transaction processing tasks such as order entry, inventory status, and materials planning is rooted in the powerful MPE III multiprogramming executive operating system. MPE III dynamically allocates system resources, ensuring high throughput and fast response time—crucial to transaction processing environments.

The HP3000 Series 33 has many features commonly found only on large mainframe systems (see HP3000 features listed on page 7). And it is totally MPE III compatible. HP supported Series 33 software and application programs can be run on the Series II and III without any recompilation or coding changes.

Buy only the performance you need now

Hewlett-Packard now offers a compatible family of HP3000s with different prices, reflecting different performance capabilities and designs. As documented in performance studies, the Series 33, with 16 terminals in a one megabyte configuration, can process approximately 2000 transactions per hour at a response time of less than six seconds. A Series III offers approximately twice this performance in a similar set-up. You purchase only what you need.

HP, a leader in semiconductor memory, has 256K bytes of 16K RAM error-correcting, fault-control main memory standard in the Series 33. Expansion to one megabyte requires no additional power supply or card cage. Just add the new memory boards and change one system software parameter.

The Series 33 comes complete with a microprocessor-controlled system console, a one megabyte flexible disc drive, and a 20 megabyte disc drive. However, it can accommodate up to eight HP discs of 20, 50, or 120 megabytes each. External memory can be expanded up to 960 megabytes. The Series 33 can also support 31 terminals, four 1600 bpi mag tapes, and two printers.

Easy maintainability

Maintenance can be a major cost of ownership. Naturally, the more time spent in maintenance-related travel and labor, the more it costs you. Hewlett-Packard has made an effort to reduce these expenses through a high-level, self-test diagnostic program and a remote system verification program. Each turns the system console into a powerful stand-alone maintenance computer.

The comprehensive cartridge-loaded self-test, HP's first level of support, can be run at any time to locate possible failures. Just plug in the cartridge and press the "READ" key. The entire CPU, a general I/O channel, the flexible disc drive, the first 128K bytes of memory, and an asynchronous data communications controller are tested in less than two minutes—without the aid of a service specialist. The console informs you of test results using friendly, conversational displays. Once the problem is identified, call your Hewlett-Packard customer engineer. The necessary repairs can be made quickly, with minimal system downtime.

Go remote

Some problems will elude even the most sophisticated diagnostics. Should the self-test not locate your trouble, you can utilize the Series 33's innovative remote system verification program (RSVP). Via your own asynchronous telephone modem, it is possible to give complete interactive control of all the system's maintenance capabilities to an HP customer engineer located at any HP office. Remote serviceability puts multilevels of HP expertise at your fingertips and reduces customer engineer travel time. Results: better service efficiency, maximum system uptime, and lower maintenance costs.

Interested in the powerful, low-cost, entry level HP3000 Series 33? Prices begin at $70,000.* For more information, please indicate B on the reply card.

HP3000 Series III

△

MPE III:
multiprogramming executive operating system

LANGUAGES:
COBOL, BASIC, FORTRAN, RPG, SPL

IMAGE/QUERY:
data base management/inquiry system

VIEW:
complete data entry facility

▼

HP3000 Series 33

With the Series 33, low cost doesn't mean low power. This entry-level HP3000 computer has many large-system features and is upward-compatible with the entire HP3000 family.

---

*U.S. domestic price

Technology update: Silicon-on-Sapphire

Both of the business computers featured in this issue extensively use Silicon-on-Sapphire technology. We asked the Computer Systems Group R & D Manager, Marco Negrete, to bring us up to date on HP's involvement with this emerging technology.

Marco, why did HP choose to invest so heavily in Silicon-on-Sapphire technology for its computer products?

"We saw some unique advantages in SOS that a bulk silicon approach just doesn't offer. Sapphire virtually eliminates those stray and parasitic capacitances that seriously degrade performance and limit the length of interconnects. Sapphire also dielectrically isolates devices without our needing to add complex process steps.

"The gains we've seen with SOS are significant improvements in speed, power and level of integration—all with a relatively simple process. For example, one single SOS chip, the 16-bit general purpose microprocessor used throughout our product line, contains the equivalent of 10,000 devices. Another example, our processor chip has a micro-cycle time of 270 to 720 nanoseconds.

What are HP's accomplishments to date with this new technology?

"I believe that a good measure of success is the number of products using SOS devices. We've been shipping SOS for more than a year now, and the list of our products using this technology is growing rapidly. SOS was first placed in the HP 2240 measurement and control system, quickly followed by our serial printers—the 2631 and 2635. We're especially pleased with the recent introduction of two new business computer systems: the HP300, and HP3000 Series 33. Both use SOS for the central processor as well as for other functions. The breadth and range of our chips is impressive. We have over 25 different chip designs so far.

Marco Negrete, Group R & D Manager

"In terms of reliability, we found—as expected—those improvements that are associated with lower power devices.

"To date, I'm pleased to report that with the extent of our SOS use, we've had only a handful of devices returned from the field. We feel this record is in part due to the fact that we subject all SOS chips to an extensive product assurance program which weeds out 'infant mortalities.'"

How does HP plan to advance SOS technology now?

"We have two major goals. The first is to increase our production capacity and efficiency to satisfy the growing product demands. In fact, we're in the process of building a highly automated manufacturing facility of 6500 square feet.

"Secondly, we're aggressively pursuing the advantages of SOS. We're already well on our way toward introducing the first of several planned stages of process improvements."

What challenges lie ahead?

"In any emerging technology, there are bound to be many technical challenges. But specifically for SOS, the challenge will be one of materials—that of maximizing the inherent advantages of sapphire as we push toward smaller and smaller devices. Much of our attention will be focused on improving the Silicon/Sapphire interface and hetroepitaxial growth techniques."

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THE NEW SOFTWARE ECONOMICS

PART 1

By Werner L. Frank

Software for sale is the best bargain in town, the most underpriced property ever developed in any industry — and the only realistic way to control burgeoning data processing costs, according to Werner L. Frank. Frank, the executive vice-president of Informatics, Inc., explores that thesis in this four-part series, beginning this week.

Today's data processing world is still a world of hardware. While we would all agree that a computer is only as good as its software — and that a computer without software is useless — the action and attention seem, nevertheless, to be on the iron.

This machine fixation can be observed in the attention a new device attracts. Certainly the journals abound in reporting on hardware performance, perhaps because it is easier to measure. How often are computer programs heralded in terms of scope of application or with respect to efficiency of operation?

In the American Federation of Information Processing Societies' 1977 publication, "Information Processing in the United States: A Qualitative Summary," not one mention of software is made in Chapter II, which discusses suppliers. The price/performance ratio for computer hardware, value of the installed base and value of new shipments are all discussed to account for the industry's health, but there is no mention of software's impact.

Does a user ever seek software first and incidentally select the associated hardware? Often the hardware is selected and software is the secondary concern. Even our professional society, founded in 1947, is called the Association for Computing *Machinery*.

The general situation with respect to data processing today can be summed up in two statements:

(1) Hardware advances continue, with more cost-effective components and systems constantly available. These improvements are measurable and beneficial to the user.

(2) Software continues to be on the critical path in developing and maintaining all information processing systems. Software productivity and reliability have not been quantifiable. Hence, software is perceived as out of control and viewed with apprehension.

Usually these two phenomena lead the observer to the conclusion that software costs are outstripping hardware expenditures and that 90 cents out of every dollar spent on data processing will go toward software within a decade. However, the facts do not support these conclusions, as I pointed out in the In Depth article, "The Ten Great Software Myths" [CW, March 6, 13].

Is software, therefore, as important as some would have us believe — threatening to become the major expenditure in a world of throw-away electronic modules?

Actually, both hardware and software user expenditures are continually increasing (around 10% to 15% per annum), but remain proportionately stable with respect to each other as a result of the following:

- More money is spent on hardware (despite decreasing unit costs) because more complex configurations are necessary to support the increasingly complex requirements.
- The increasing complexity of operating systems results in an ever smaller fraction of machine resources being available for "useful" processing — requiring even more hardware capability per unit of application software operation.
- More complex applications are being implemented, so the software production task is more costly.
- More software (people) effort is devoted to on going maintenance because operational applications are increasing in number and complexity.
- Increasing labor costs are incurred because of inflation and shortages of experienced manpower.

These hardware-software relationships yield one clear observation — increasingly cost-effective improvements are associated with hardware while software productivity reaches near-stagnation.

Software, in such a setting, should become an ever increasing proportion of the total cost, but several deterrents exist:

- Additional hardware supports software efforts as a productivity aid in, for example, on-line programming and in the form of minicomputers for more ready access.
- The demands for remote processing give rise to greater hardware needs in the form of terminals, multiplexers, concentrators and communications lines.
- Organizations have a limited ability to hire personnel in general and experienced DP professionals in particular. Budgets also have a way of being a natural resistance to gross expansions.

Therefore, in the presence of increasing capability demands and growing maintenance requirements, software development projects will be spread over longer periods.

- Proprietary software products, turnkey application systems and data services extend the development capacity of organizations and increase their productivity. Ready-made software, in the form of a product or service, spreads development and maintenance costs over a broad set of users and also creates a community of interest and commitment that facilitates that software's validity and continued enhancement. That is economic leverage.

It is, of course, the last point which prompts the writing of this In-Depth on the economics of software as a product.

In an interesting *Harvard Business Review* article of January-February 1978, "Costs and Benefits of a Data Base System," McFadden and Suver provided a scenario of a medium-size manufacturer moving from a conventional batch file processing environment to an upgraded data base management system (DBMS) operating in an on-line mode.

The incremental hardware and software

(Continued on In Depth/3)

Memorex Cubic HD Computer Tape. Guaranteed tested at 6250 bpi and 1600 bpi.

At last a computer tape that's more than just "suitable" for 6250 bpi applications: Memorex Cubic HD.

It's the computer tape specifically formulated and tested for the demands of 6250 bpi applications. The tape that's passed the most demanding test: each reel is tested at 6250 bpi and 1600 bpi to insure optimum performance on your system.

We believe we are the only manufacturer of computer tape to actually test computer tape at 6250 bpi and 1600 bpi. That gives us added confidence in our Cubic HD product and in the long-term performance you will achieve with Cubic HD on your system. But testing is only part of the story. Cubic HD has a thicker base film which reduces edge damage, provides extra dimensional stability that reduces skew propensity, and improves autoloading.

What's more, this exclusive new tape is wound on SuperReel™ tape reels, Memorex's advanced design reel that's 90% stronger than conventional reels; enhancing high-speed, high-tension drive performance. Improved autoloading. And better tape winds —rewind after rewind.

Cubic HD is manufactured by a new process and utilizes an enhanced proprietary oxide formulation that provides optimum signal recovery and incorporates a cross-linked binder for reduced oxide shed. The benefit is a cleaner running tape with less error-rate buildup.

In short, testing at 6250 bpi plus a thicker base film plus SuperReel plus a new proprietary oxide formulation and process equals an optimized computer tape for high density applications—Cubic HD.

New oxide formulation Thinner coating + Tested at 6250 + Thicker Base Film + SuperReel = Cubic HD Optimized 6250 Tape

See your Memorex Computer Media representative to find out all about it. Offices in principal cities worldwide, or contact us at 1200 Memorex Drive, Santa Clara, California 95052. Phone toll free (800) 538-8028. In California, call collect (408) 987-2410.

MEMOREX
Computer Media Products

(Continued from In Depth/1)

costs, over a five-year period, were judged to be:

SOFTWARE	
DBMS	$100,000
TP Monitor	15,000
Training	20,000
Total	$135,000

HARDWARE	
CPU Upgrade	$150,000
Memory Expansion	125,000
Storage Devices	100,000
Terminals	30,000
Total	$405,000

The indicated hardware increases included a step-up in the CPU itself, immediately doubling main memory to 512K bytes, the addition of several disk storage units and an associated controller and the addition of six CRT terminals.

The model description was completed by recognizing a conversion cost of $115,000 and personnel additions to the current staff (i.e., DBMS administrators) at an annual cost of about $80,000. The article also estimated the five-year expected benefits to the total business as a result of this incremental expenditure and improvement in the DP activity.

The example provided an excellent microcosm of a financial decision resting with management. The total five-year additional cost in introducing DBMS technology was put at more than $1 million, with an expected cumulative benefit value of over $2 million.

The study concluded that the investment was worthwhile since it promised an attractive return on investment. The total additional investment breakdown was:

Software	12%
Hardware	38%
Operational Support	50%

showing a three-to-one incremental expenditure of hardware to software.

The software, of course, was purchased off-the-shelf. An equivalent in-house development of a DBMS and teleprocessing monitor would have required two to three years and a cost of more than $1 million. Even if the organization had the investment capital and time to undertake such a project, it would not have had the manpower capacity or quality to staff such a highly technologically oriented activity.

Needless to say, an in-house development of this nature, even if possible, would never yield a sufficient return on investment for the entity. A home-grown DBMS would not be a realizable option.

The model allows us to make some points:

- Off-the-shelf software gives technological leverage to organizations, with leapfrogging increases in performance.
- Purchased software, when applicable, is incredibly inexpensive compared with in-house development.
- Software for sale has typically cost a fraction of the hardware necessary for its operation.

We also observe from data presented in the article that the economic benefit sought by the user was achieved by an incremental increase in the base hardware expenditure of 30%, with only an additional data base administrator added to the staff for a modest increase in head count of 4%.

It was the software that prompted the investment decision, and it was the software that was expected to provide the major economic benefit. While the bottom-line benefits have until now favored the hardware vendor over the software vendor, a change which will correct this inequity is bound to occur.

A Second Example

In a second setting, a look backward further discloses the benefits gained from purchased software.

The 10-year software purchase profiles of four typical large users of one product are shown in Figure 1 (see In Depth/5): The initial product value commitment is identified, together with subsequent purchases of optional features and educational services. The maintenance charge currently being applied, as a function of the installed product value, ranges between 4% and 6% per annum.

The cost of optional features are approximately two-thirds of the initial product value, and the education serv-

(Continued on In Depth/5)

HOW TO SWITCH COMPUTERS WITHOUT SCRAPPING SOFTWARE.

You've reached the point where your business requires the independence and control that comes with your own minicomputer.

But, you have a large investment in current applications and you're impressed with the power and flexibility of mainframe performance.

Relax. With an NCSS 3200 computing system, you get the best of both worlds.

You get a computer that runs performance-proven software programs and also accepts your current 370 software applications.

That means savings to you, because the time and expense involved in converting software to your new computer or developing new programs can add over 50% to the cost of your new system.

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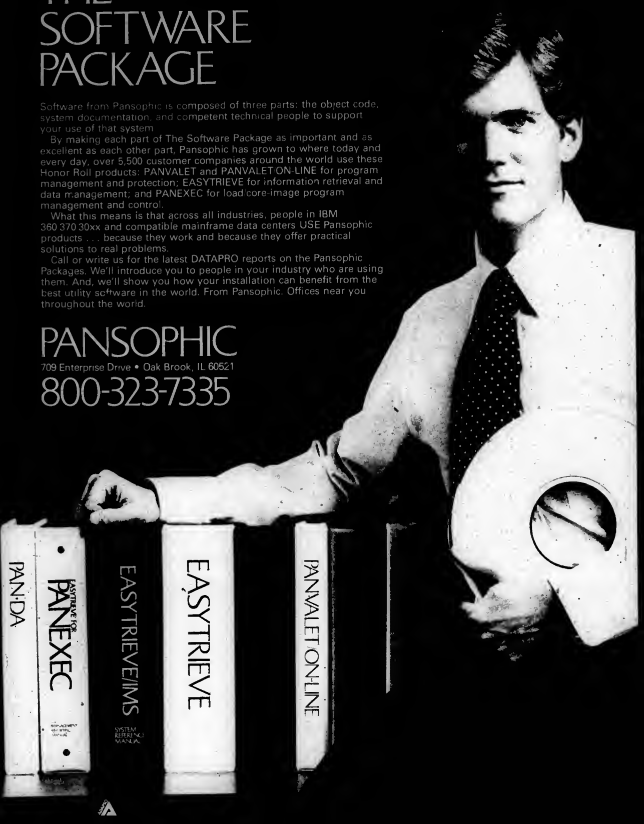

(Continued from In Depth/3)

ice is slightly more than 10% of the total expenditure. The user's average expenditure during the entire 10-year period is $60,000.

In all cases, the hardware expenditure level for these users is substantially greater than that of their software. In fact, each of these users migrated through two CPU configurations during the decade; typically an IBM 360/30 or 40 to an IBM 370/145 or 158. The expenditure for software pales to insignificance by the millions spent on hardware.

Is it a paradox that critical software commands such a fraction of the value of hardware?

A Third Example

Let us take a further look and consider a giant user who also has benefited from the same software product in dozens of installations during a decade of use.

This organization has spent close to $500,000 for the use of the software, which has consumed some 25% of ongoing computer resource capacity. The ratio of this software cost to its proportional use of the hardware cost during the decade has been less than 1:1,000.

Further, based on the acknowledged manpower savings of 25% derived from this software, the user has gained a return on investment of 1,000% in the 10-year period. Very few opportunities in business provide such a return with negligible risk.

No fewer than two large users have asserted that for certain purchased software, the payback gained from manpower savings in software development alone is returned *each* month.

Can software be that significant, have so much leverage and yet be so inexpensive? We shall argue that the economics dictate a correction and that software product prices must increase in order to provide the proper business basis for this industry

But What Is Software?

DP professionals and users may well consider unnecessary the issue of defining software. After all, is software not the programs which provide the "intelligence" that makes the computer do useful work? Or is software that which is left over out of the total DP expenditure pie once the hardware, communications and supply costs are removed?

Then again, is software not the totality of DP personnel costs, plus the expenditure for purchased or leased computer programs? And, finally, does not software also include that element of the hardware dollar which reflects the bundled operating system component?

The definition becomes even more elusive when one recognizes the extended purview of today's DP environment, where the end user is often coupled into the automated operation and may, therefore, be accountable in a census of software costs.

But defining software is useful and necessary — both for users and vendors. A definition will give users a fix on associated costs so good business decisions are achievable when considering software development and operations alternatives. The proper perspective of software will also reconcile certain accounting issues which face both user and developer.

We, therefore, define software in a narrow sense, but no more narrow than the way hardware is treated. This view, in itself, provides the following definition: Software is that which could be invoked by hardware.

As such, software includes the design and development of computer programs as well as their maintenance. It does not include the costs associated with operations.

Since there is nothing divine about where to draw the line between that which is committed to iron (hard) and that which remains on paper (soft), should not both hardware and software be treated alike?

Three current economic issues attest to de facto differences in perception between hardware and software — first, the investment protection issue associated with software patentability; second, the accounting issue of whether software development is a deferrable expense; and third, taxation issues relating to the relevance of sales and property taxes, as well as investment tax credits, to software. These topics have led to important arguments and will be examined subsequently.

If the line of demarcation between hardware and software is as arbitrary as stated here, then why the difference in treatment? To reach an understanding, we first make some comparisons

With respect to both hardware and software, the product cycle — the period from conception through service — embodies the following phases: design, development specification and prototype, manufacturing; marketing sales and support, implementation installation and training, and product support, user support and maintenance

The order suggests the standard process of manufacturing and distributing almost anything. It certainly maps the hardware vendor's scope of effort.

The steps also represent the software manufacturer's activities. Even software created in-house follows the process, with an interesting inversion in which "marketing" usually comes first — that is to say, the particular software is identified and "sold" to some user/sponsor at the outset and then the other phases are initiated.

Figure 2 compares the product cycle for vendor-provided hardware and software, assigning relative weights to each phase by ascribing cost levels as a percent of sales.

The cost of the individual factors reflects the absorption in the ultimate product price of the amortized investment over an assumed production run. The table reflects, of course, only ven-

(Continued on In Depth/6)

SOFTWARE PRODUCT USER SPENDING PROFILES

Percent Distribution

	USER A	USER B	USER C	USER D
BASE PRICE	50	51	76	49
OPTIONS	50	30	21	34
EDUCATION	0	19	3	17

Figure 1

VENDOR HARDWARE/SOFTWARE PRODUCT CYCLE RELATIVE COSTS

PHASES	HARDWARE	SOFTWARE
Design	Low	Medium
Development	Low	Medium
Manufacturing	Medium	None
Marketing	Medium	Very High
Implementation	Low	Low
Product Support	Medium	High

Figure 2

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(Continued from In Depth/5)

dor costs and not the user's conversion and ultimate operating expenditures.

In the case of hardware, no single cost element is deemed to be a "high" contributor. Design and development are spread over a large production run, as well as a number of associated model families. Maintenance is controlled, either by the stability of the electronics or by simply charging a sufficient price to cover cost.

The table is representative of a typical hardware vendor — not IBM — which is believed to have relatively lower manufacturing costs and relatively higher product support costs.

Software is quite different. The medium to high components of cost reflect the labor intensiveness of the process. There is an absence of what in the hardware product cycle is called "manufacturing."

This last fact has led to a good bit of misunderstanding. For example, in a *Computerworld* article of Jan. 16, 1978, a financial analyst at Kidder, Peabody & Co., Inc. asserted that "software is unique in that its incremental production cost is virtually zero. . . Volume sales of software will provide even greater cost and flexibility advantages to suppliers than do volume sales of hardware." This statement ignored the unusually high cost of marketing and maintenance that overshadow the "incremental production cost.

Development is most demanding of the proprietary software product supplier. The quality of specification, code and documentation is often more expensive by a factor of 5 compared with custom production for a single user. Marketing costs are significantly higher as a percent of revenue than in the case of hardware. The product support requirements of the user and the maintenance are a somewhat higher percentage of revenue.

These differences between the hardware and software vendor economics have been misunderstood and are the major reasons why the software vendor underprices his goods and the user evaluates these prices with a hardware buyer's view.

These subjects will be discussed in more quantitative terms later.

Software's Life Cycle

Software is a dynamic process that exists within the framework of a comprehensive life cycle. A definitive statement of this life cycle was given by B. Boehm in the article "Software Engineering" in the December 1976 issue of *IEEE Transactions on Computers*. This life cycle consists of the following steps or activities:

- System requirements.
- Software requirements.
- Preliminary design.
- Detailed design.
- Code and debug.
- Test and preoperation.
- Operation and maintenance.

Viewed in this broad sense, software becomes more than the computer program and more than the process of design and coding. Included are the direct activities listed above, as well as the ancillary but important tasks of documentation and training. The concept of this paper excludes the efforts of operation, whether it entails machine or human resources.

Maintenance and operation are somewhat difficult to distinguish. Maintenance refers here to correcting and preserving the end-product software's ability to operate in a selected hardware environment. Enhancement to the system is therefore viewed separately, as is the actual production aspect of operating the system or the application.

The life cycle for software was at one time assumed to be rather short. It was at most identified with the life cycle of associated hardware, and that was perhaps a six-year time frame. However, the software life cycle today transcends its target machine because of compatible computer families. In fact, target machines or their equivalent continue to operate long after they are depreciated.

As an example, hardware of the early 1960s continues to be operable at the end of the '70s — so software of the previous decade still survives. For instance, we can cite the over 10-year life cycle history of the Informatics, Inc. Mark IV system. This software has operated on the IBM 360 and 370 families of computers, and its capabilities are further extended today on the IBM series 30 line of computers, as well as

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Vice President, Research, International Data Corporation
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James E. Thornton
President, Network Systems Corporation
"New Alternatives in Systems Architecture." Will conversion/migration between non-compatible systems be easier by 1982/83? More or less costly? And what innovative architecture choices are open to users now?

James McGuire
President, Computer Division, National CSS
"Computer Services, User Hardware Hybrid Systems." Why are the service companies now supplying their own hardware? What's next?

Dr. James W. Jewett
Vanderbilt University, and President, Telos Research Group
"Communications Systems — Optimizing 1980 Alternatives." How can users select from new carrier offerings in the packet and satellite areas? What compromises and trade-offs are needed with existing communication network investment?

Additional speakers to be announced.

Richard L. Nolan,
Chairman, Nolan, Norton & Company
"Planning to Manage the New Systems Technology in the 1980's." Managing and adapting to fast-paced changes in technology and marketplaces, cost-benefits analysis and cost control.

the plug-compatible CPUs offered by Amdahl Corp., Itel Corp. and a host of others.

A Mark IV source program written in 1968 can still operate today under its most recent release — and in a totally different hardware and operating system environment.

The life span of current hardware, such as the IBM 370/158 type, can be extended for another 10-year period, even if the workload increases at an annual compounded rate of 25%. This is achievable by moving to more powerful, plug-compatible hardware manufactured by IBM, Itel or Amdahl.

Indeed, the power of such advanced CPUs over the Model 158 is available even now at a factor of 8 to 10 — and most beneficial for users at a price/-performance level which is better by a factor of 4.

In other words, currently operable IBM 370 software can be exploited for another decade, with plenty of workload growth opportunity, as well as significant unit cost reductions.

Alternative Marketplace

But there is another, quite opposite alternative for users in exploiting their software investment. The marketplace for used computers is especially attractive as a result of the substantial price/performance advances made in the new generation of systems.

Recent residual values of such used mainframes, as a percent of list price, have been quoted as follows by American Computer Appraisal Service:

IBM 360/40	10%
IBM 360/65	10%
IBM 370/145	50%
IBM 370/155	40%

Older versions of tapes, disks and printers are not as cheap, and maintenance is expensive, but it may still become exceedingly worthwhile to retain and even improve "old" software, continuing to operate it on bargain-value old computers.

And, finally, there is the opportunity for continuing to exploit 20-year-old software under emulation or simulation techniques. For example, it is still possible to execute IBM 1400 series Autocoder software developed in the early '60s on most 370 models via the hardware compatibility feature.

One product, SIM-14 from Dearborn Computer Company, even provides a software solution to preserving the operability of 1401, 1440 and 1460 programs on all current IBM 360, 370 and compatible equipment.

Users therefore have a variety of choices in extending their software life cycle, including:

- The emulation or simulation of old software on new computers.
- The operation of existing software on used (old) cost-effective computers.
- The preservatiun of existing software on life cycle kickers or compatible CPUs.

This flexibility gives users for the first time a number of alternatives in preserving their investment in existing software or in making new commitments to off-the-shelf software. This is the basis for exploiting the new software economics.

The Issues With Software

Software is an intellectual process that encompasses all the difficulties associated with controlling and predicting human understanding and behavior. Software is also an end product that can be measured and observed. This combination of attributes has led to problems in software productivity.

Software is essentially a 100% value-added activity and is possibly a unique commercial phenomenon. Counterparts may be works of art, novels, movies and music, but these are not beset by the same problems as software. During software's life cycle of repetitive utilization, there is a severe demand for maintenance and a continual need for enchancement.

Nowhere in the marketplace does there seem to be another product with such characteristics. Furthermore, the labor intensiveness of the software process is, in itself, unique.

In all aspects, software as an end product presents problems in design, implementation and operation. There are also problems in planning and managing the development process itself.

In order to understand the problems in software productivity, it is appropriate to explore some of the recent

(Continued on In Depth/10)

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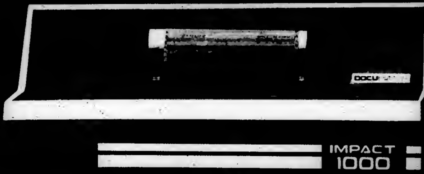

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PROGRAM POPULATION BY SIZE*

NUMBER OF LINES OF CODE**	PROGRAM SIZE	PERCENT OF TOTAL PROGRAM POPULATION
Less Than 2K	Small	70
2K to 16K	Low-Medium	20
16K to 64K	Medium	6
64K to 512K	Large	3
Over 512K	Super Large	1

* Data from IBM Technical Report TR 02.764, January 1977

** Units of Assembly Code

Figure 3

SOFTWARE ECONOMICS

Cumulative Percent of Program Population	A = Machine Operating Cost	B = Development Cost Plus 33% Maintenance	Ratio A/B
50%	$41,000	$7,992	.01
93%	$896,000	$14,823	.06
100%	$4,112,000	$15,894	.26

*Data from R.C. Kendall

Figure 4

(Continued from In Depth/7)

findings regarding software production and life cycle maintenance.

Software Roadmap

There are small and large software systems, and there are one-time as well as repetitive, production-oriented application systems. Before reviewing software issues, it behooves us to survey the present software terrain and, wherever possible, place perceived problems in perspective.

First, there is the issue of program size. Most problems occur with the larger software endeavors. In a 1977 study on "Program Quality and Programmer Productivity," T.C. Jones of IBM cited the distribution of the world's population of programs and provided a breakdown of program size with respect to number of lines of source code, excluding comments.

These results are shown in Figure 3. Note that a substantial number of the programs (70%) are essentially one-person tasks. This data, if generally true, suggests that major software problems really occur in only 4% of all the programs that are developed.

Another issue concerns the life span and operating characteristics of a program. This subject was studied by Robert C. Kendall of IBM in his paper, "Management Perspectives in Programs, Programming and Productivity." Kendall reviewed life cycle statistics for a population of 5,328 application programs developed within several IBM organizations and found the average life span of a program to be about 16 months.

Figure 4 summarizes some of his further interesting findings. For example, the actual machine operating costs, over an assumed life cycle of 33 months, was unusually low in relation to the estimated development and maintenance costs. The data assumed that 33% of the staff provided maintenance for the resulting programs.

As seen from Figure 4, the ratio of machine operating costs to development cost and maintenance was a surprisingly low 6% for up to 93% of the total number of programs in the population. The most time-consuming jobs, located at the upper end of the program count, showed a higher ratio, although the measure still continued to remain low.

Kendall concluded that 50% of all programs absorb less than 2% of a machine's operating capacity and that 2% of the programs occupy better than 50% of a machine's runtime.

The conclusion is that the cost of development and maintenance of almost all programs is substantially larger than their cost of operation. Based on these studies, ongoing software performance improvement, when it is an issue, can be relegated to a very small and identifiable set of applications. However, the authors warned that the data reflects very specific studies at IBM, so each user must assess his own environment in order to establish conclusions relevant to his situation.

The planning of software has not evolved very far from the experience in the 1960s recorded by Frederick

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B	80	89	11
C	130	155	19
D	150	129	-14
E	90	122	36
F	60	90	50
G	125	101	-19
H	61	80	31
Average	1.10	105	-5

*From "Estimating Software Development Costs," Publication E40-350-501, Datapro Research Corp., 1976

Figure 5

Brooks in his well known *The Mythical Man-Month* (Addison Wesley, 1975). One of the fundamental problems underlying software development is the sheer difficulty of estimating the size of the project at the outset.

Statistics from a recent software development estimating study reported by Datapro Research Corp. are shown in Figure 5. Note the tremendous variance in estimating from one individual to another and for the same individual over a period of time. The ratio of project dollar value from high to low is 3:1 and 2:1, respectively, for the quick and the detailed estimates.

While the average for each of the "quick" and "detailed" estimates closely conforms, how much significance can be attached to this fact as a consequence of one experiment? On the other hand, estimating by informed consensus may be the best we can do.

Development Budgeting

Part of the problem in estimating software development budgets relates to properly assessing the various stages of the project and providing sufficient manpower and machine capacity.

Lines of code production is one technique that is often used. This approach may suffice for certain simple steps making up a software system as, for example, the number of lines of code required to do a typical edit of a character string.

More complex projects — those involving the interaction of many people — require detailed analysis in two directions:

(1) Assessing the scope of the problems to be solved.

(2) Providing enough time for integrating all of the pieces making up the whole.

Much has been learned over the last 20 years to aid in this task. For example, the architectural aspect of software construction is eased by:

- Modularizing to the utmost all aspects of the program.
- Separating data from program steps.
- Developing table- or parameter-driven systems.
- Utilizing standard software pieces developed and checked out in prior projects.
- Relying on major support systems produced by others (e.g., data base management systems).

Technologies Emerging

Certain technologies are emerging to help this process even further. These are the design and specification techniques advanced with such systems as the Program Design Language (PDL) of Caine, Farber & Gordon, Inc., the Structural Analysis and Design Techniques of Softech, Inc. and the Design Methodology of Jackson.

But no matter what the design and programming aids or the organizational ingenuity in motivating and achieving goals, time generally cannot be traded for manpower, as Brooks so aptly argued in *The Mythical Man-Month*.

The development budget must recognize certain inescapable truisms whose impact increase nonlinearly as software projects grow in scope:

- Programming costs over the total life cycle (as distinguished from development only) must be given the highest priority.
- The distribution of effort over design, coding and testing must be on the order of 2:1:3, respectively
- Minimizing defects in design and errors in code is essential. Their detection should be pursued at the earliest possible stage of development, as removal costs increase exponentially over time.

Roadmap, Not Panacea

Perhaps the most useful data so far provided to aid in assessing programming expenses comes from the previously cited landmark report of T.C. Jones. These results are shown in Figure 6. The author emphasized that his observations do not provide a panacea, but act rather as a roadmap which one can follow when faced with a specific software environment.

PROGRAMMING EXPENSES BY PROGRAM SIZE*
QUANTITY PER THOUSAND LINES OF CODE

Program Size In Lines Of Code**	Manpower Time (months)	CPU Hours	Number Expected Defects
Less Than 2K	.5 to 3	.2 to 2	0 to 25
2K to 16K	.8 to 5	.5 to 4	0 to 40
16K to 64K	1 to 8	1 to 10	.5 to 50
64K to 512K	2 to 16	5 to 100	2 to 70
Over 512K	4 to 28	10 to 200	4 to 100

*Data from IBM Technical Report TR 02.764, January 1977

**Measured in Assembler Language and operating on an IBM 370/155

Figure 6

I view the question of productivity in software development and operation in the global sense. However, productivity is often a concern in a more narrow sense that has to do with the production of useful code by programmers. It is in this regard that organizing and motivating techniques and procedures have been developed to increase code production and its associated quality.

The history of programmer productivity is bleak. A line of code costs more to produce today than it did 10 years ago because of wage inflation and because of the need to generate

(Continued on In Depth/14)

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Revising the Communications Act of 1934 — RICHARD E WILEY, Kirkland & Ellis, The Hon LIONEL VAN DEERLIN, House of Representatives, HARRY M SHOOSHAN III, Esq., Chief Counsel, House Subcommittee on Communications, ROBERT R BRUCE Esq., Gen Counsel, Federal Communications Commission, A G W BIDDLE, Pres., Computer & Communications Industry, WALTER HINCHMAN, Esq., WILLIAM G McGOWAN, Chairman of the Board, MCI Telecommunications Corporation WILLIAM G SHARWELL, V Pres., AT & T, EMANUEL FTHENAKIS, Pres., American Satellite Corp., E F MURPHY Pres., RCA Global Communications, Inc

Network Strategy — Dr. HOWARD FRANK, Pres., Network Analysis Corp.; JOHN GANTZ, Director, SNA Acceptance Survey, Editor, Distributed Processing Reporting Service, International Data Corp

Luncheon Address — HENRY GELLER, Esq., Asst Sec for Communications and Information, NTIA

Network Planning & Design — LYNN HOPEWELL, Dir. of Network Engineering Operations, Computer Sciences Corp., ROBERT CRAIG, V Pres., Chase Manhattan Bank, JAMES JEWETT, Prof., Grad School of Management, Vanderbilt University

Telecommunications Management — HARRY NEWTON, Publisher, The Telecom Library, GERALD ELY, V Pres., Merrill Lynch Company

Facsimile Network Applications — PAUL BROBST, V Pres-Operations, Rapicom JIM HAWKINS, Dir of Product Mngmnt., Graphnet, Dr JEROME LUCAS, Sr Scientist, Research Eng., Comsat, ED ENOCHS, Facsimile Systems Product Mngmnt., Computer Communications, Inc

Optical Communications Technology for Networks — JEFFREY C. HECHT, Managing Editor, Laser Focus Magazine, JOHN E FULENWIDER, Sr Staff Consultant-Telecommunications Sciences, Arthur D Little; Dr IRA JACOBS, Dir., Wideband Transmission Lab., Bell Telephone Laboratories, BART BIELAWSKI, V Pres., Sales & Marketing, Siecor Optical Cables Inc

New Developments in Voice Network Applications — JAMES R. CARREKER, V Pres., Product Dev., Datapoint Corp.; ROY LAYTON, Dir of Communications, Allstate Insurance Company, WILLIAM HOOTEN, Communications Manager, Morrison Knudsen Co., KERRY B STEWART, Mngr./Telecommunications, Kellwood Company

Intelligent Network Switching Systems — JERRY W FINEFROCK, Mngr., Network Management, Southern Pacific Communications Co., MICHAEL D. BLACKWELL, Tandem Systems Marketing, AT & T

WEDNESDAY

Network Access & Interface — TOM J MERCER, Communications Systems Consultant, Satellite Business Systems, B H HARCHARIK, Pres., Tymnet, RAY SANDERS, Pres., TRAN

Office Administrative Networks — HOWARD ANDERSON, Pres., The Yankee Group, JAMES DOUGHERTY, Communications Manager, Equitable Life Assurance Society

User's Voice in Telecommunications Policy — PHILIP ONSTAD, Mngr Telecommunications Policy, Control Data Corp., LARRY F DARBY, Chief, Common Carrier Bureau, Federal Communications Commission, BERT C ROBERTS, Jr., Sr V Pres., MCI, SEYMOUR R ROSEN, Asst V Pres-SMG, Citibank

ACS and the Future of Packet Networks — Dr JOHN M. McQUILLAN, Mngr Systems Analysis Dept., Bolt, Beranek & Newman, Inc., LARRY ROBERTS, Chrmn., Telenet Communica-

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Network Security and Encryption — BELDEN MENKUS, Consultant, R. BARRY ASHBY, Pres : Ashby and Associates; HERBERT BRIGHT, Pres , Computation Planning

Implementing Tomorrow's Office — Dr. JAMES H CARLISLE, Pres , Office of the Future, Inc , SANDFORD F KAIT, Mngr , Corporate Information Systems. ITT. EDWARD SCOTT. Asst Sec , Dept of Transpertation

Limited Distance Networks – GERALD MUELLER, Sr Consultant, R.L Dean & Associates, WILLIAM NUGENT, Dir , Automated Systems Office, Library of Congress; ED MILLBURY V Pres Engineering. Gandalf Data, Inc , GEORGE SPARK, Develcon Electronics

Trends in High Performance Network Components — ROBERT J KAUFMAN. Mngr , Data Communications, Damon Corp , Dr DAVID LYON, Dir of Research & Development, Intertel, Inc., EDWARD MILLBURY, V Pres -Engineering, Gandall Data, Inc

Using Value-Added Networks — ELY S LURIN, Principal, Input, Inc , LYMAN HARDEMANN, Consultant-Telecommunications, R L. Deal & Associates, ALLAN KRONENBERG, Telecommunications Dept , Metropolitan Life Ins Co , JOHN ATWOOD, Dir of Communications, Hughes Aircraft Co

Futurist's Field Day — DRAKE LUNDELL, Editor, Computerworld; CARL HAMMER, Dir., Computer Sciences, Sperry Univac, CHARLES P LECHT, Pres , Advanced Computer Techniques, TED MERRILL, Communications Editor, Business Week, WINSTON E HIMSWORTH, V Pres , Salomon Brothers

THURSDAY

Electronic Message Systems — Dr KAS KALBA, Pres , Kalba Bowen Associates, Inc , PHILIP S NYBORG, V Pres & Gen Cnsl., Computer & Communications Industry Association, WILLIAM VON MEISTER, Pres , Digital Broadcasting Corp.; JOHN McLAUGHLIN, Exec Dir , Postal & Allied Arenas, Harvard Univ Program on Information Resource Policy; WILLIAM COMBS, V Pres., Xerox Xten Service, CARVER WASHBURN, V Pres of Strategic Planning, Western Union Telegraph Co , HAROLD R JOHNSON, V Pres , Marketing, American Satellite Corp

Privacy In Communication Networks — WILLIAM WEWER, Sutherland, Asbill & Brennan, JERRY LOBEL, Mngr , Computer Security & Privacy, Honeywell Information Systems; RICHARD SCHRIVER, Sr V Pres Corporate Systems, Chase Manhattan Bank, JAMES HOWARD, Esq , Counsel, Natl Telecommunications & Information Administration

Future of Communication Terminals — CHARLES CAMPBELL, Project Editor, Data Communications, Auerbach Publishers Inc , DANIEL H CARTER, Mngr , Strategic & Long Range Business Planning, Texas Instruments Digital Systems Group, ROBIN WHITE, Dir of Product Planning, ADDS, Inc ; JOSEPH SIMMONS, V Pres , Threshold Technology

International Issues and Costs — GARY AUDIN, Pres , Delphi, Inc ; JOSEPH M KITTNER, Esq , McKenna, Wilkinson & Kittner, JAMES S BLASZAK, Common Carrier Bureau, Federal Communications Commission, WILLIAM C BRASUELL, Mgr Telecommunications, Fairchild Semiconductor Co.

Network Economics — Dr LEE L SELWYN, Pres , Economics & Technology Inc , ROBERT BENNIS, Dir of Telecommunications, Westinghouse Electric Corp., TORRENCE W SNYDER, Dir Advanced Planning & Research Div General Services Administration Automated Data & Telecommunications Service; MERRILL E BLAU, Technical Consultant, Natl Communications, Sears, Roebuck, & Company

Satellite Carrier Capabilities — RONALD McCABE, Mngr , Communication Analysis, Satellite Business Systems, WILLIAM BROOK, Asst V Pres Satellite Programs, Western Union Telegraph Co , Dr EUGENE CACCIAMINI, V Pres -Technical, American Satellite Corp

International Network Carrier Trends — Dr THOMAS MATHAI, V Pres Data and Facsimile Services, RCA Global Communications, MARTIN WEISBARD, Dir Network Engineering, ITT World Communications, DONALD R STACKHOUSE, V Pres Operations & Engineering, RCA Global Communications

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IN DEPTH

(Continued from In Depth/11)

more complex code for more sophisticated application.

An often quoted productivity improvement factor is the neglible 3% per annum reported in the Share-sponsored Silt Committee book, *Data Processing in 1980-1985* (John Wiley and Sons, 1976). This, of course, is hardly a perceptible amount in contrast to the increasing order of magnitude of hardware's cost-effectiveness. Indeed, the authors of this book stated that if these figures are correct, then "programmer productivity is [the] potential bottleneck to future growth of data processing."

Among the latest techniques in organizing programming projects are those employing aspects of structured programming, including top-down processes, walk-throughs and chief programmers Boehm cited some results in a 1976 TRW report, "Structured Programming: Problems, Pitfalls and Payoffs." While no definitive conclusions were reached, it appears that it is possible to achieve a 50% improvement in the cost of developing software when employing these techniques, mainly because the error rate is reduced.

In other studies, the use of on-line, time-sharing methods for coding and debugging are advertised as beneficial in increasing program production, again by factors which on a composite basis are of the order of 50%

Maintenance is the most misunderstood and underestimated aspect of software's entire life cycle. As will be shown, software maintenance demands a great deal more than hardware maintenance.

Maintenance costs surpass the original development effort by an impressive factor of 3:5, assuming at least a five-year operating life for the software. It is not unreasonable for software developed in-house to grow in instruction size by 50% and have more than 50% of its original code replaced during the first three years of its operation!

An insidious aspect of this problem is that in order to correct one line of code it is necessary to generate five lines of code. In itself, this process causes the generation of new errors.

Another aspect of ongoing maintenance is the necessary experience factor. Maintenance is not one of the tasks relished by professionals; hence there is a substantial turnover in this activity — an activity which is highly dependent upon intimate knowledge of the system.

Personnel engaged in software are becoming increasingly more involved in maintaining it, as well as sustaining its environment, rather than applying themselves to the development of new applications.

Observers of the industry have reported that maintenance costs, as a percent of the ongoing personnel budget, range from a low of 30% to as much as 60%. This is sufficiently large so that special attention given to its reduction could have real economic benefits.

Two Major Activities

The maintenance of software inclodes two major activities — the removal of defects and the enhancement of operations.

Defects in the software are of two kinds:

- Inconsistency with design or specifications which causes the program to do other than that which is desired by the user.
- Errors in the program logic that cause the software to operate apart from the written requirements or the intent of the programmer.

The cost of defect removal relative to the phase of the life cycle in which the defect is detected is another revealing statistic. In Boehm's *IEEE Transactions* article, experiences at IBM, TRW and GTE were related which support the exponential increase in time (hence dollars) needed to find solutions to fix errors in software as the life cycle passes from the requirements to the operational phase. This empirical data proved we should go to great lengths to catch errors (in program or logic) as early as possible.

Boehm also reports that the ratio of design to coding errors is 3:2. This evidence further supports the observation that the more effort that goes into a front-end design, the better the payoff in total life cycle software performance.

J.H. Frame of IBM, in a talk entitled

Saving money by not doing it yourself

A guide to applications packages in January 29 Computerworld.

The increasing flexibility of the new software packages is rapidly making in-house development the exception rather than the rule of software planning. And more and more vendors are marketing easily convertible software packages to suit the time and budget needs of computer-users, large and small.

Applications Packages is the subject of our January 29 *Computerworld* Special Report, and in it we'll be examing many of the ways users are putting these newer, more flexible packages to work for them. Edited by Don Leavitt, *Applications Packages* will take a look at the increasing technological (and financial) feasibility of these new packages, and why they've become so attractive to users. We'll have vendors' stories as well, with articles on:

- *Software evaluation — choosing the right packages for the right system*
- *Cutting the costs of software maintenance*
- *Program conversion — is it worth the effort?*
- *"Firmware emulation"* and the technology behind portable packages.

If you're an MIS Executive, DP Manager, Supervisor or Lead Programmer, our January 29 Special Report will make some informative reading. And if you market programming products or services, here is a good place to put your advertising. Ad closing date is January 12, and your *Computerworld* representative can give you all the details. Or, to reserve space for your ad, call Terry Williams at (617) 965-5800.

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"Major Trends in Software Quality: 1978-1985" and given at the December 1977 Conference on Software in Washington, D.C., stated that 50% of the total effort in software development is attributable to defect removal. He also said that correcting software errors is 38 times more expensive during the machine test phase than during the initial design effort.

Even more dramatic is the cost of defect removal after software is operational, where a factor of 114 was identified as the multiple of cost over early code correction.

Frame further reported achieving software productivity improvements at his IBM laboratory by adopting modern programming techniques. Seventy-five percent to 80% of potential defects were found before testing began. The results of this improvement in initial software quality led to a 15% reduction in cost per line of code.

This 15% is impressive when related not only to the modest 3% increased productivity already cited, but also to claims that software costs are continually rising. The question is, of course, whether continually improving quality can net an even greater cost reduction.

Individual Differences

When all is said and done, the ultimate factor in software productivity is the capability of the individual software practitioner. Even in the presence of better techniques and aids, productivty in the software process is heavily dependent on individual performance. This, of course, is software's Achilles heel and the basis for its labor intensiveness.

In his 1973 TRW paper on "The High Cost of Software," Boehm cited two sources who reported individual performance differences of 26:1 and 10:1 in producing software. Thus the most important factors in productivity are not the programming languages and organizational techniques, but individual's innate talent. Assembling a super team of software producers can thus be considered the sine qua non in tackling these issues.

Werner L. Frank is executive vice-president and a director of Informatics, Inc. The firm is an independent supplier of software, professional services and information processing services.

Frank is a co-founder of Informatics and has been active in the management of the company for the past 17 years. During that time he also was president of Equimatics, Inc., a joint venture of Informatics and The Equitable Life Assurance Society of the U.S.

Secondary Issues

We cannot end this discussion of software economics without recognizing certain secondary effects on an organization when software does not perform according to expectation.

Unfortunately, software becomes most prominent as major system projects approach their expected target date for completion. Since the most difficult part of software development — the testing and integration — cannot take place until all other elements of the system are operative, software will always be in focus on the critical path.

But when software is late or non-operative, the organization may incur additional expenses. This includes delivered and unused hardware, communications, facilities and personnel. Conversion efforts and parallel operations may be jeopardized. Timing for shifting to the new operation may be delayed, causing additional costs from the older system.

- Software delays can generate "consequential damage" which is significant. Fortunately, this problem is avoidable when uff-the-shelf software is available.

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James W. Walker, M.D., (right) is president of Professional Insurance Management Company (PIMCO) of Jacksonville. Paul Middleton is his NCR account manager. The photo was taken in the formal garden behind the PIMCO offices on the edge of the St. John River.

WALKER:
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Newcomer to Offer 11/35-Type Mini

By Marcy Rosenberg
CW Staff

WILMINGTON, Mass. — A manufacturer of roadside motorist call boxes is expected to jump into the minicomputer arena next week when it introduces a system series that can reportedly provide roughly the same performance as the Digital Equipment Corp. PDP-11/35 for about half the cost.

The company, Solid State Technology, Inc. (SST), will supply its Athena family with assorted memory and peripheral options that will allow the series to expand from an intelligent terminal at the low end to a turnkey stand-alone processor at the high end, according to an SST spokesman.

As an intelligent terminal, the Athena system will serve primarily as a remote station in distributed processing networks and will communicate synchronously, asynchronously and bisynchronously at 110- to 9,600 bit/sec. Communications protocols like Synchronous Data Link Control, High-Level Data Link Control and others will allow the SST family to interact with high-end IBM 370s, Control Data Corp. Cyber series systems and other familiar mainframe models, the source said.

The low-end Athenas will also communicate in distributed processing networks with up to seven other similarly configured or larger SST systems.

As stand-alone processors, the series will reportedly equal or exceed the performance of the DEC PDP-11/34 and Sycor, Inc. 445 as well as the PDP-11/35.

Though intended primarily for OEMs, the Athena line also suits large commercial end users, especially Fortune 1,000 firms that plan to incorporate the systems in their distributed processing networks.

The Athena series consists basically of a desk-like enclosure and a series of hardware modules that serve as system building blocks. By choosing the right combination of modules, buyers can create a range of configurations, each geared to a different application need.

A typical mid-range Athena system consists of a 16K- to 64K-byte CPU, dual 128K-byte cassette units, dual 512K-byte floppy disk units and 150 char./sec matrix printer.

Users can expand that configuration into a "full-blown" standalone processor, however, by increasing the CPU's main memory to its 64K-byte limit, attaching a 300 line/min printer and using one or more 40M-, 80M- or 300M-byte hard disk units, the source explained.

'Stripped-Down' Configuration

Or, at the opposite extreme, users can downgrade the Athena series to a low-end system by leaving part of the enclosure's space empty and installing just a 16K-byte CPU, CRT terminal and keyboard.

In such a "stripped-down" configuration, the system would serve mainly as an intelligent terminal for relatively small users like travel agencies and hospitals, the spokesman said.

The Athena series hardware cabinet provides enough space for a CPU, main memory expandable in 16K-byte increments, integral CRT terminal, keyboard, matrix printer, dual cassette units and dual floppy disk units.

Outside the enclosure, however, users can attach up to four additional 512K-byte floppy disk units without changing controllers. Or with enhanced control-

(Continued on Page 70)

Pair of Systems Lets Realty Firm Match Homes, Prospective Buyers

ST. LOUIS — Home buyers and home brokers alike have reaped the benefits of two mini-based systems that match houses and prospective owners in much the same way that computer dating services match prospective mates.

Since its implementation three years ago, the real estate matching service has reportedly helped more than 90% of its users find the kinds of houses they want.

Because of this high "hit rate," a local realtor — Gundaker Real Estate Co. — has boosted its revenues an estimated sixfold and has tripled the size of its sales office network during the last three years.

Operated by John F. Steffen Associates, a mechanical and electrical engineering firm here, the two minicomputer systems store more than 6,000 local real estate listings, which Gundaker's 18 offices update daily.

Buyers' Needs Identified

When one of the broker's 750 agents interviews a prospective buyer, he or she tries to find out the client's exact housing needs. Some of the factors they inquire about include house-style, school district, price range, number of bathrooms and number of bedrooms.

The agents then enter this house-selection data into the dual minicomputers through their own portable computer terminals, which weigh about 13 lb each. Using a software package written by Steffen employees, the minis check the incoming buyer specifications against Gundaker's computerized list of available houses.

If the computer-cross-check uncovers any dwellings that seem to suit a buyer's needs, the minis list the prospects a few seconds later through the real estate agent's remote terminal.

If, however, the cross-check produces no results at first, the agent uses the terminal to enter the prospective buyer's name, address, phone number and housing needs into Gundaker's data base. Then, as the real estate listings are updated, the minis automatically match the buyer with any new entries that seem compatible.

The real estate matching systems also help Gundaker officials analyze housing market trends and decide where to locate new sales offices.

Since it began using the systems, Gundaker has reportedly grown from the fifth largest to the leading broker in the local real estate market. In 1976, the

(Continued on Page 66)

Desktop Series Claimed Faster Than IBM 5110

NEW YORK — An APL interpreter plus a virtual storage capability reportedly give a desktop system series from Interactive Computer Systems, Inc. (ICS) an average of three to four times more processing speed than its closest rival, the IBM 5110.

With up to 24K bytes of main memory and 256K bytes of virtual floppy disk storage, the MCM 900 also operates five to six times faster than its ICS predecessor, the MCM 800, according to a spokesman for the product's developer.

Benchmark tests show the MCM 900 provides a typical random file retrieval time of one to two seconds, compared to "minutes" with the 5110, the source reported. As a result, the ICS series is said to particularly suit applications involving file access and large data base retrieval.

In addition to operating as a stand-alone system, the MCM 900 offers an optional communications interface that allows the series to operate as a remote station in a distributed processing network or as an interactive batch-entry unit in commercial time-sharing, the spokesman

(Continued on Page 70)

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Genisco Boosts Resolution Of Graphics Units by 20%

IRVINE, Calif. — Genisco Computers, Inc., has reportedly boosted the resolution of its graphics system line by 20% with the introduction of a display unit that permits full use of a 1,024-line CRT screen.

The raster display system provides a 1,280 pixel/line resolution, cmpared to 1,024 pixel/line for the highest resolution models previously available from Genisco, according to a spokesman for the company.

Cycling internally at 150 nsec, the 1,024-line (1,310,720-point) system incorporates a proprietary programmable graphics processor that provides 55 mnemonic instructions, the source said. It also incorporates a monitor control module, 16K-byte random-access memory, interfacing for most CPUs and graphics operating system software.

In addition, the expandable system offers a cross assembler software package written in Fortran IV and supports up to 12 monitors.

Options include a 64-programmable-function keyboard, x-y-z input joystick, 11-in. by 11-in. graphic input tablet and x-y positioning "trackball."

The system costs less than $18,000 and is available now from Genisco at 17805 Sky Park Circle Drive, Irvine, Calif. 92714.

Minis Assist Realtors

(Continued from Page 65)

first year it subscribed to the minicomputer service, Gundaker's revenues doubled to $100 million.

In 1977, sales doubled again, and last year revenues topped an estimated $300 million.

The minis have also benefited Steffen Associates, which has added more than 50% to its sales by using the machines to design buildings, control construction costs and help architects and engineers increase the accuracy of their bids.

The systems that Gundaker borrows from Steffen incorporate two Prime Computer, Inc. Model 400 CPUs, one with a 1M-byte main memory and the other with a 512K-byte main memory. Some of the other hardware modules include three 80M-byte disk units, a 300 line/min printer, 30 in-house CRT terminals and two magnetic tape units.

In addition, the systems support 20 portable terminals for Gundaker's real estate agents and 20 similar units that Steffen's engineers use to estimate building costs.

The current equipment represents the latest in a long series of computer systems the firm has tested in its 10 years of operation. When Steffen first went into business, it relied on a service bureau to store and analyze design and construction data.

As the company grew, it scrapped the ootside time-sharing system and bought an in-house batch-processing system, which was used for "range estimating," a method of forecasting a construction project's minimum and maximum costs.

Three years ago, Steffen scrapped the batch-processing machine, which had become overburdened with work, and replaced it with a larger in-house time-sharing system. But although the replacement system tripled Steffen's computing capacity, it could support only three to four concorrent users — a volume woefully inadequate for both Steffen and Gundaker.

Recognizing this limitation, officials with the engineering firm once again decided to change computer systems. The new hardware, they concluded, would have to support a much larger number of users and languages than any in-house system they had previously owned. It would also have to expand to keep pace with Steffen's growing business needs.

With these selection criteria in mind, company officials bought their first Prime 400 system in October 1976. The system runs programs up to 32 million bytes long and supports up to 64 simultaneous users.

Then, last January, Steffen acquired its second Model 400-system and in so doing doubled its computing capacity.

Disk Pack Offered For Univac's 8418

SANTA CLARA, Calif. — Intended for Univac's 8418 disk drive system, the latest addition to Memorex Corp.'s disk pack line stores up to 58M bytes and provides a coating formulation that reportedly reduces head wear and prolongs head life.

The Mark XVIII disk pack also provides a nonflammable cover, tempered steel locking assembly and forged aluminum hubs, according to a Memorex spokesman.

The pack costs $450 and is available immediately from Memorex at San Tomas and Central Expressway, Santa Clara, Calif. 95052.

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DEC Extends High End Of Minc System Family

MARLBORO, Mass. — Digital Equipment Corp. recently expanded its Minc family of microcomputer-based laboratory systems with a high-end member that reportedly provides a 64K-byte main memory and 10M bytes of mass storage in a standard configuration.

The Declab-11/MNC is said to be an expanded version of DEC's recently introduced entry-level Minc system, which incorporates a 30K-byte main memory and 256K bytes of floppy disk storage.

Like its sister system, the Declab-11/MNC includes a PDP-11/03 microcomputer that accepts up to eight peripheral and scientific instrument connectors. Through these plug-in connectors, users can link their CPUs to seven types of hardware modules that can be mixed in any combination to produce customized laboratory configurations, according to a DEC spokesman.

Some of the hardware modules users can link to their high-end systems include digital-to-analog converters, analog-to-digital converters, multiplexers, input units and output units.

Additional Features

Besides the CPU and its dual disk units, the standard system provides a four-port terminal interface, a read-only memory diagnostic bootstrap and a choice of either an LA36 Decwriter II or a VT105 CRT terminal, which displays alphanumeric, point-plot and histogram waveform data.

Standard software for the system reportedly includes Ansi-standard Fortran IV and a package of Fortran routines that permit interval histogramming, peak and envelope processing, Fast Fourier transforms and power spectrum analyses. Another package of more than 100 Fortran-callable routines, meanwhile, accommodates T-statistics, multiple linear regression, Fresnel integrals and Legendre polynomials.

Among its hardware options, the Declab-11/MNC offers an IEEE-488 bus interface and a second pair of RL01 disk units. The interface supports up to 14 laboratory instruments and testing modules simultaneously, while the additional disk units allow the system to accommodate up to 20M bytes of mass storage, the spokesman said.

Software options include two high-level languages and RT-11/Decnet, which allows the system to operate in a network with any other system controlled by Decnet communications software. The two high-level languages — RT-11 Basic and RT-11/AP1 — provide an alternative to standard Fortran IV, the source added.

The Declab-11/MNC costs $21,000 and will become available this month from DEC at 146 Main St., Maynard, Mass. 01754.

Disk Controller Suits DG Units

BURLINGTON, Mass. — All Data General Corp. Nova and Eclipse minis can now accommodate up to four "storage module" type disk units with a Xylogics, Inc. disk controller that provides 1.2G bytes of unformatted storage, according to a Xylogics spokesman.

Using a microprogrammable processor, the Model 850 emulates its DG counterpart, the 6060X disk unit controller, and resides on one 15-in. by 15-in. circuit board that occupies a single CPU chassis slot. Xylogics sources credit the controller's packaging with reducing space requirements and improving access to the unit.

The controller is also said to support storage module or cartridge module units from Ampex Corp., California Computer Products, Inc. and Memorex Corp.

Software available with the Model 850 includes DG's Real-Time Disk Operating System and Advanced Operating System or independent Blis/Cobol or Iris offerings, the sources said.

Some of the Model 850's features include automatic position verification, error-correction code, multiple computer access, direct memory access throttle, implied seek, overlap seek for multiple-spindle applications, bad sector flagging and sector interleaving.

The unit costs $3,600 and is available from Xylogics at 42 Third Ave., Burlington, Mass. 01803.

IBM's 'Common' To Meet in Philly

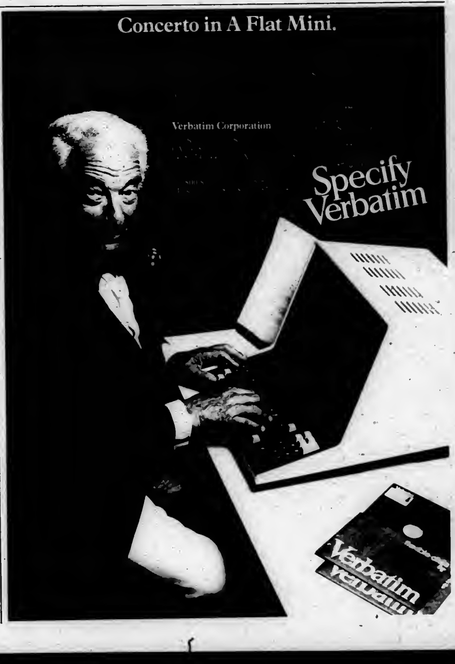
PHILADELPHIA — IBM's small systems users group, Common, will hold its spring 1979 conference at the Marriott Hotel here on April 8-11.

Attendees are expected to include users of the systems 3, 7, 32, 34, 1130, 1800 and 5100 and Series/1.

Intended to promote effective use of IBM hardware and to facilitate the exchange of DP information, the conference will offer more than 50 sessions in which speakers from both IBM and its user community will update attendees on recent technical developments in the minicomputer field, according to a Common official.

Laboratory, regional and other IBM personnel will also be available to answer user questions.

Additional information can be obtained from David G. Lister, administrative director, Common-B1, Suite 1717, 435 N. Michigan Ave., Chicago, Ill. 60611.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LONDON — When a firm as old and renowned as Lloyd's of London has to upgrade its central computer system, it tries to do so on time and within budget.

Moreover, because of the company's high level of growth during the last 15 years, any such modernization has to be nondisruptive, and a dual minicomputer has made that possible for the firm.

Realizing that usual system improvements frequently result in months of readjustment — and assorted headaches including reprogramming, operation changes and budget overruns — the company formed a research group to determine hardware and software options plus user requirements. The group — formed from Lloyd's corporate management, underwriters, brokers and managers of DP user departments — defined a system concept for the company's long-range needs long before negotiations with vendors began.

Lloyd's previous systems were small, batch-oriented and centralized. With the company's growth, these systems had reached their work capacity and could not accommodate the expansion requirements defined by the evaluation team. In addition, the requirement for handling data from Lloyd's Policy Signing Office (LPSO) included lengthy validation and error-correction features that would have been uneconomical to run with a mainframe system.

Best Solution Suggested

The results of the studies indicated that two independent computer systems — one for conventional batch/-accounting functions, another for interactive transaction-processing operations — would best suit Lloyd's needs. By reserving the mainframe system(s) for traditional DP functions, the large computers could be used more effectively.

The transaction-processing, interactive computer, meanwhile, would handle policy validation and related transactions.

The mainframe systems, installed in a new and enlarged facility southeast of London, consisted of twin IBM 370/148s. The new systems were deemed capable of absorbing Lloyd's anticipated DP workload and becoming part of an integrated data base management system slated for operation by the end of 1981.

To complement the mainframes, Lloyd's developed an interactive system, built around two Digital Equipment Corp. PDP-11/70 minicomputers, which were configured to meet the LPSO's requirements.

The LPSO validates all policy descriptions against the handwritten slips that serve as agreements between underwriters in the market. This validation takes the place of the traditional policy signing by underwriters or syndicates. The LPSO currently attaches its seal to about 13 million transactions per year.

Before Lloyd's implemented its minicomputer-based system, all LPSO transactions either had to be keypunched on cards for batch processing or keyed to disks. Further, LPSO must generate daily, monthly and quarterly transaction reports, which used to be processed on a mainframe.

Using the mainframe for data entry and validation and for report generation had become a serious problem as Lloyd's volume grew. In fact, average processing times totaled as much as 15 days.

The PDP-11/70-based system eliminated that problem. Located at the LPSO site, the system supports 80 interactive CRT terminals that allow data entry operators to check and correct errors at the point of entry. It also incorporates two 512K-byte CPUs and six disk drive units.

Lloyd's credits the minicomputer system with cutting its policy processing time by 50% and with holding administrative and DP costs to 4% to 7% of the firm's total operating costs. At most other insurance companies, administrative and DP costs account for as much as 25% of total expenses, according to Lloyd's.

One PDP-11/70 does production work, while the other serves as backup, if required. The second system is thus usually-free for software development and maintenance.

Application software for the system has been developed jointly by Lloyd's and two outside software consulting firms. The basic operating system, DEC's RSX-11M, is the foundation for various application programs, including one which performs large-scale transaction processing.

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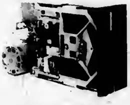
Diskette Unit Unveiled

IRVINE, Calif. — A dual-head diskette unit from Ex-Cello-O Corp.'s Remex Division stores up to 1.6M bytes of unformatted data and up to 1M byte in the IBM 128-byte sector format, according to a Remex source.

Media-compatible with the single-sided IBM 33FD and two-sided IBM 43FD single and double-density diskette units, the RFD 4000 reportedly provides a 3-msec track-to-track access and seeks in an average of 91 msec, including settling time.

In the RFD 4000's design, the bottom head attaches to the head carriage, while the top head mounts on a movable load arm linked to the carriage, the spokesman explained.

The unit, which is electrically and physically compatible with Shugart Associates' SA850 and SA851 disk units, costs $740 and is available from Remex at Box C-19533, 1733 Alton St., Irvine, Calif. 92713.



Remex's RFD 4000

Meta 4 Addition Performs Alone or as RJE Station

SAN DIEGO — Though suitable as a stand-alone processor, the latest addition to Digital Scientific Corp.'s Meta 4 minicomputer system series also serves as a remote job entry (RJE) station and emulates various IBM communications terminals.

When running under the Exec 2 or Exec 8 operating systems, the Meta 4/5010 performs RJE functions for Univac 1100 series mainframes or for Control Data Corp. systems serving as UT200 terminals, according to a Digital Scientific spokesman. With accompanying software packages, the 5010 also reportedly emulates IBM 2780, 3780 and certain 3740 terminals to permit communications in distributed networks built around IBM 370 series, Amdahl Corp. and Itel Corp. mainframes.

In addition, a subset of the machine's mnemonic instruction set includes commands that allow the 5010 to emulate IBM 1130 or 1130-type systems.

Capable of communicating bisynchronously with hosts at up to 9,600 bit/sec, the 5010 provides a DM-2 operating system with an assembler and Fortran compiler as standard features and an expanded Fortran compiler as an option.

Some typical instruction speeds for the 16-bit system are as follows:

- Load, 1.45 microsec.
- Add/Subtract, 1.45 microsec.
- Store, 1.5 microsec.
- Branch, 1.6 microsec.
- Shift 6 bits, 2.3 microsec.
- Multiply, 7.65 microsec.
- Divide, 8.9 microsec.

With a 500-nsec storage cycle, the 5010 expands in 16K-byte increments from 16K- to 64K bytes of main memory, the source said.

The mini also incorporates the Sentry power and environmental monitoring system, which detects problems ranging from defective ac power to dirty air filters and notes faulty conditions on a maintenance service panel.

Sentry is said to monitor the system's primary ac voltage range and internal cooling mechanism and to warn of impending out-of-tolerance conditions with visual and audio alarms.

A minimum 5010 configuration with a 16K-byte CPU, real-time clock, four I/O controllers, 1M-byte cartridge disk unit, 300 line/min printer and card reader costs $43,300 with $385/mo maintenance charges.

A communications-oriented system with a 32K-byte CPU, similar peripherals configuration, bisynchronous communications adapter and IBM 3780 support costs $48,900 with $465/mo maintenance charges.

Digital Scientific is located at 11425 Sorrento Valley Road, San Diego, Calif. 92121.

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- Burroughs TD820
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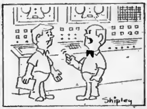

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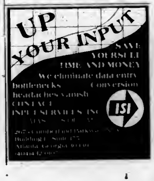

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IEEE-488 Bus Users Gain Floppy Diskette System

SAN DIEGO — Users of the IEEE-488 general-purpose interface bus can reportedly link IBM-compatible diskette units to their systems with a floppy diskette system series from Dylon Corp.

Equipped with an intelligent programming and formatting controller, the 8000 series accepts the IBM 3740 format for single-density recording and the IBM 2/2D format for double-density recording.

Dylon credits the 8000 series with interpreting commands from the IEEE-488 bus and permitting data transfer between a flexible diskette and a host system.

Available in stand-alone or rack-mounted versions, the IEEE-488 bus-compatible diskette system reportedly stores 600K bytes per diskette side and accommodates up to four single- or dual-head drives for a total storage capacity of about 5M bytes.

It also buffers up to 4K bytes, transfers up to 100K byte/sec and provides phase-lock loop circuitry.

A dual-drive, dual-density system with a 5M-byte storage capacity costs $4,995 and is available from Dylon at 3670 Ruffin Road, San Diego, Calif. 92123.

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Printer Outputs 18 Page/Min

LOWELL, Mass. — By using photo-optics to generate characters, a printer from Wang Laboratories, Inc. can reportedly output 12 times faster than typical line printers and more than 50 times faster than conventional typewriters.

Compatible both with Wang's computer product line and with its recently introduced Office Information System/100 word processing systems series, the Image printer produces 18 page/min, compared with two-thirds of a page/min for typical line printers and one-third of a page/min for typewriters, according to a company spokesman.

The intelligent printer also forms characters with 90,000 dot/sq in., mixes various type sizes and styles within the same printout and doubles as an office copier, the source added.

Wang credits these and other performance advantages to the unit's fiber optics printing system, which converts CRT-displayed characters into light images and then "paints" them onto paper coated with a dry toner like that used in copiers.

In operation, the product uses a data channel to transfer a completed document from a system disk to the printer's microprocessor control unit. There, the Image system assigns the print commands and selects the font and type sizes specified by an operator, the spokesman explained.

A character generator then converts the digitized document into images and displays them, one line at a time, on an integral CRT terminal. After scanning each line, the printer's electronics change the displayed data into light pulses, which the fiber optics subsystem reads, a spokesman noted.

The signals then go to two receptors positioned above the paper, are turned into character images and are transferred to the medium.

Six Type Styles

Besides offering four operator-selectable font sizes —10-, 12- and 15-pitch fonts plus proportional spacing — the Image printer provides six type styles: Prestige Pica 10, Courier 10, Elite 12, Courier 12, Roman proportional space and bold pruportional space, the source said. Users can insert any two fonts in the same document and mix the fonts without restrictions between lines.

The printer costs $35,000 with a $400/mo maintenance charge and leases for $1,500/mo, including maintenance under a one-year contract. Wang is located at One Industrial Ave., Lowell, Mass. 01851.

Mini to Compare to PDP-11/35

(Continued from Page 65)

lers, the system can support a choice of four 40M-, 80M- or 300M-byte hard disk units for a total add-on storage capacity of up to 1.2G bytes, the source added.

Other hardware modules not incorporated in the integrated Athena system include the 300 line/min printer plus assorted other peripherals like plotters, optical character recognition equipment and "dumb" CRT terminals. Each of these add-on I/O units except the 300 line/min printer is said to attach to the system through dual RS-232C or 20mA current loop interfaces.

All versions of the Athena minicomputer family run under the same multitasking operating system, which supports high-level programming languages like Basic, Fortran, Pascal, Cobol and APL.

Depending on the hardware configuration, an SST series system costs $10,000 to $15,000 in OEM quantities. A similarly configured PDP11/35, by contrast, costs $25,000 to $35,000, he noted.

SST, which will begin shipping the Athena family in production quantities in April, is located at 11 Upton Drive, Wilmington, Mass. 01887.

Desktop Series Unveiled by ICS

(Continued from Page 65)

said.

The ICS desktop series consists of three versions: the 8K-byte Model 908, 16K-byte Model 916 and 24K-byte Model 924. In addition to its CPU and random-access main memory, each model incorporates a Model DDS-1000 dual diskette drive unit with more than 1M byte of random-access mass storage.

The three models also incorporate a CRT terminal plus an interface card and accompanying software that supports any Centronics Data Computer Corp. printer, the source added. Printers available with the series range from 45 char./sec daisy-wheel units to 180 char./sec matrix serial models to 300 line/min units.

The accompanying CRT terminal, meanwhile, provides a 12-in., 2,016-char screen, numeric keypad with seven functions and a programmable alarm.

Communications Features

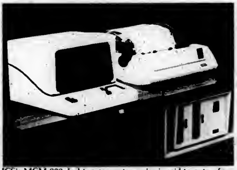
Among its communications features, the MCM 900 series transmits asynchronously at 300 to 4,800 bit/sec and emulates various dumb as well as intelligent terminals, the source said. The series also provides an optional RS-232C serial interface and emulates any asynchronous peripheral connection.

Application software with the MCM 900 includes packages for accounting, word processing, financial and technical jobs as well as for report generation, operations research and management sciences.

A compatible word processing system, the Text/900, also reportedly allows the MCM 900 to combine DP and word processing functiuns.

Without a printer and dual diskette unit, the Model 908, 916 and 924 cost $9,300, $9,650 and $9,950, respectively. With printer and diskette system, prices of the three models range from $15,000 to $18,000.

ICS is located at Suite 16W, 310 E. 46th St., New York, N.Y. 10017.



ICS's MCM 900 desktop computer series is said to outperform the IBM 5110 by three-to fourfold.

System 'Collars' Data Fast for Apparel Chain

QUAKERTOWN, Pa. — A minicomputer-based direct data capture system has helped an East Coast women's apparel chain streamline its DP operation, increase security and free its sales force from paperwork.

"The day after Thanksgiving, one of the busiest days in the retail year, one store made $12,500 in sales. We had 19 salespeople working, and at the end of the day, our accounts were exact — to the penny," according to company controller Sandra Hassler.

This kind of accuracy and control in retail sales was unheard of just a few years ago, but is now almost routine because of direct data capture.

Apparel Affiliates, Inc. owns and operates 35 high fashion women's stores in five eastern states. With sales topping $15 million a year, the chain bases its DP operation on an IBM System/3 Model 10 and a Digital Equipment Corp. PDP-11/34.

Apparel's DP system was planned to provide all necessary management information and accounting functions. Software for the System/3 includes a wide range of RPG-II-written application programs, while the PDP-11/34 uses RSX-11M with Fortran IV and PAL Macro 11.

Transactor Unit

With these systems, the firm can efficiently provide management reports and audit control. The problem is getting the necessary information into the system, Hassler explained. To overcome this hurdle, Apparel Affiliates uses a data capture system manufactured by Transaction Management, Inc. of Montgomeryville, Pa.

The heart of the system is the transactor unit, which takes in data at the time and place of the transaction and produces both hard copies and computer-format data on magnetic tape cartridges.

The retail clothing and apparel business is plagued with management problems, the shipment of incomplete and incorrect orders, inventory control difficulties, shrinkage because of error and theft and a product line constantly changing to meet fashion demands. Apparel Affiliates has successfully used the direct data capture technique to solve these and other problems, Hassler said.

In the past, Apparel captured much of its data manually. Sales tickets were generated in advance and seldom matched the orders actually shipped. Inventory errors had to be corrected manually, and separate backorder and cancellation records were kept.

Sales slips were prepared manually and had to be matched by hand to electromechanical cash register tapes. Audits of these records had to be verified manually and keypunched and the cards again verified manually.

Each clerk and store manager spent an average of two hours a day on paperwork in addition to the 31 man-hours of work that the company's central office auditing and DP units did daily.

Direct Method

Now, by using the transactor unit in a direct data capture system, all the unnecessary paperwork is eliminated, the controller said.

The system works like this: When a shipment arrives, the items are priced and given a stockkeeping unit number, which indicates the type of merchandise, vendor, style, color and store location. This data enters the transactor unit, which immediately produces hard copies and computer-ready tape.

Thus, the data captured by the transactor unit can be entered directly into the computer and used immediately to produce the necessary inventory, accounting and management reports, Hassler explained.

Apparel Affiliates also uses the unit with a transaction management printing system to produce sales tickets with the price and a bar code.

At the time of sale, the clerk uses a scanning wand to read the sales ticket and enters employee number, cash or credit information or other necessary information manually. The sales information is recorded on tape, and hard copies (a customer receipt and a store audit tape) are produced.

In addition to the point-of-sale functions, the transactor unit is used to record employee in/out and leave time, bank transactions and other functions — stock transfers, merchandise movements, shipping and receiving information and price changes.

Communications Feature

Certain functions can be restricted so they can be performed only by the store manager. The transactor unit can also be set up to directly read magnetic stripe credit cards and to communicate captured data.

This communications feature is currently being adopted by the Apparel Affiliates outlet here and by some of its distant stores. Others will continue to have their tape cartridges picked up by company messenger and taken to the DP center ~~here~~, where they are prepared for data entry by a data cartridge handler.

Security is probably one of the biggest advantages of using the transactor direct data collection system. No function, including opening the cash drawer, can be performed without leaving a record, Hassler said.

Improved security and reduced DP costs have prompted Apparel Affiliates' president Roland Sigal to project that his company will recover the transactor system's purchase cost in less than two years.

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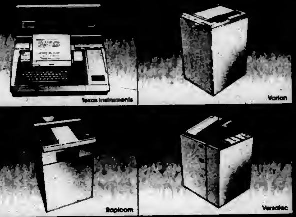

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Mini Helps Industrial Supplier to Good Start

By Marguerite Zientara
CW Staff

RALEIGH, N.C. — With the aid of a minicomputer-based order entry system installed shortly after it went into business, a 12-employee industrial supply firm generated more than $1 million in sales during its first year.

In July 1977, Carolina Indostrial Systems Supply Co. (Cissco) was founded to provide high-volume, low-cost items like cutting tools and maintenance items to large industrial manufacturers.

"It was obvious that if we wanted to better serve the large industrial plants and create a sense of excitement and uniqueness for our new business, we would have to computerize," company president Michael Mull explained.

The firm's major criteria in choosing a small business computer were price and performance. "Also, because we didn't have much money, we wanted a system that was reliable and easily upgradable," Mull added.

After benchmarking many systems including equipment from Honeywell, Inc., Texas Instruments, Inc., IBM, Burroughs Corp. and Quantel Corp., Cissco decided to acquire a Wang Laboratories, Inc. Model 2200T system.

The Model 2200T was installed in early December 1977 and was operational by February, according to a Cissco spokeswoman. Also installed were Texas Instruments Model 745 dial-up order entry and inquiry terminals in a number of customers' offices, now numbering five.

"All the customer has to do is call a special direct line to our computer, using an acoustic coupler, and type in the preprogrammed item he wants," the spokeswoman explained. In this way, the customer gets a hard copy printout of his order.

Items can be identified by the customer's ID number or a Cissco ID number and prearranged standard urder quantities can be set up for quick ordering, with multiples of that number available as well, she noted.

Some of Cissco's customers, such as utility companies, however, cannot take advantage of such a system, because they must do much of their business by bidding, in compliance with federal regulations, the spokeswoman said.

By offering an alternative to manufacturers, or 'paperless purchasing, as Mull called it, Cissco feels it has eased ordering, speeded delivery, cut needless inventory purchases and created an orderly and inexpensive method of labeling and storing inventory stock orders.

As Cissco's sales territory expanded, the firm decided to upgrade its computer system and last October installed a Model 2200VP CPU, which became operational Nov. 1. "The upgrade was inexpensive and relatively painless from a software vendor's point of view," according to Tom Kennedy, president of Dustin, Inc., who developed the system's software. "Also, the enhanced Basic language on the 2200VP helped me add more bells and whistles."

Saves $30/Order

The national industry standard price for "cutting" a purchase order is presently $31, accurding to Mull. 'With our systems approach to order entry, we save our customer about $30 every time he orders from us," Mull said.

The system also ensures efficiency for the customer. "The customer establishes his own order-entry levels," Mull said. "When inventory on a certain product, reaches a particular point, bam! — we deliver what he needs."

Included in Cissco's system is a 32K-byte Model 2200VP CPU, a 10M-byte Model 2260C fixed/removable disk unit and a 200 char./sec Model 2221 line printer.

In the future, Cissco plans to upgrade to a Model 2200MVP mini, the top of the 2200 product line. The equipment, now on order, is expected to arrive this month, Mull said. Cissco plans to configure the system initially with an 80K-byte memory.

While Cissco's entire accounting function is now computerized, the 2200MVP will reportedly allow the firm to generate order forms, inventory lists, company payroll and an account of each day's statements and salesmen's productivity reports. It will let Cissco handle 100 big accounts.

Extra-Density Minifloppy Drive Built for Desktop, Portable Units

BEDFORD, Mass. — Users can reportedly fit three BASF Systems, Inc. minifloppy disk drives in the same vertical space that would typically accommodate only two Shugart Associates, Inc. SA-400 units.

BASF spokesmen credit their 6106's superior packaging density with making the drive suitable for desktop and portable computer systems.

In addition to providing 33% more storage capacity than the SA-400, the 5.25-in. BASF unit offers 40 recording tracks and yields a 12-msec track-to-track access, compared with the industry standard of 35 recording tracks and a 40 msec track-to-track access.

Plug-compatible with the SA-400, the 6106 operates in both the FM and MFM recording modes and accommodates up to 250K bytes of unformatted storage on one floppy disk side. The minifloppy drive also comes in a double-sided version dubbed the Model 6108, according to a BASF spokesman.

Standard features include a front-plate, which covers the gap left by the smaller BASF drive, and a nonfrictional ball race for head positioning. The latter feature is said to eliminate most of the wear typically associated with ball-in-a-groove-type head-positioning mechanisms.

Options include software-controlled door interlock, head-loaded activity indicator and a head-load control that operates independently of the unit's select control.

Until recently, the 6106 was available only in Europe, the operational center for BASF Systems, a German-owned company. Now, however, BASF is producing the minifloppy dirve in the U.S.

Because the 6106 is still relatively new to the American scene, it is available only in sample quantities.

The product costs $450 in single quantities and $225 in quantities of 500.

BASF Systems is located at Crosby Drive, Bedford, Mass. 01730.

BASF's 5.25-in. minifloppy disk drive, the Model 6106, is said to be 33% smaller than the SA-400, its Shugart counterpart,

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Transit Strike Stops Buses

Micro Gets Stranded Riders to Work

By Ann Dooley
CW Staff

COLUMBUS, Ohio — Radio station WNCI helped get some stranded bus riders to work during a recent transit strike here by using a microcomputer system to match them with people commuting by car.

The strike by Transport Workers Local 208 against the Central Ohio Transit Authority began last Nov. 19, lasted 12 days and affected an estimated 30,000 riders in Franklin County before a settlement was reached.

On the first day of the strike, WNCI, an FM station that plays contemporary music, responded by attempting to use a manual system to match drivers and riders. Radio station workers put people with similar Zip Codes together and in the process, accumulated large masses of papers that were spread all around the newsroom, news director Stan Broadway recalled.

It was apparent right away that the project was hopelessly bogged down. Matching people by Zip Codes is really an unmanageable idea — each code covers a fairly large area — but at the time it had seemed to be the easiest way to do it, he explained.

Store Loans System

Broadway decided the only way the car pool project could work was to use an automated system. After several calls were made to area manufacturers, a local Radio Shack store agreed to loan equipment and devised a program to match riders and drivers.

The store donated a TRS-80 system programmed in Basic with 16K of memory, two disk drives and a printer. Store manager William Louden modified a customer information program overnight so that riders could call the station for information before the rush hour began the next morning and be met with faster service.

If the basics for the program hadn't already been designed, it would have been impossible to meet that early morning deadline, and a lot of people wouldn't have made it to work, Louden noted.

Information on drivers who volunteered their cars was entered into the system. The statistics that were taken from these volunteers included their Zip Codes of origin and destination, addresses, telephone numbers, departure times and the space available in their cars.

When a person needing a ride called, his origin and destination Zip Codes were entered and matched with one or more drivers who either lived or worked near the caller and who would be arriving at and departing from work at approximately the same time.

The first edit the system performed was to match the Zip Codes and then narrow down the choices by the approximate departure times and then by the available space. When a match occurred, the system deducted one space from that driver's car.

The system worked so well that it was usually possible to match the caller with a ride while he waited on the phone — usually within 20 seconds, Louden said. Once a match was made, the information, including the driver's phone number, was given out so the caller could get in touch with the driver.

'Incredible Advantages'

"It wasn't an effort to bust the strikers," Broadway said, but simply an attempt to bring together those riders who had no other means of transportation with drivers who volunteered their cars. A total of 275 riders were matched throughout the 12 days. However, the station had no way to count how many people called since the heavy call-in periods were so hectic and rushed.

The automated system offered "incredible advantages" over the manual one, Broadway stated. In addition to the speed with which it could make matches, the system also found matches that human workers had overlooked.

And even though radio personnel had never used a computer before, they had no problem operating it — and even played some games on it during quiet periods.

The system worked smoothly overall except for one failure. Four days into the strike, it lost a file. "But within an hour and a half, the system was up and running again," Louden noted. "We had to recopy the file and get it back up on time for the next rush hour's barrage of phone calls. After that, a duplicate was made for backup."

Before returning the system to Radio Shack after the strike was settled, the station used the donated printer to send thank you letters to the volunteer drivers.

WNCI is now considering setting up a permanent car pool system to help conserve fuel and reduce traffic in Franklin County.

Business Sticks to Tradition, But Turns to Modern Tool

HAMBURG, W. Germany — Baking is an industry that has flourished without major changes for hundreds of years and is still dependent upon the skill of human hands. But when Kurt Vernimb, owner of one of the oldest bakeries and the most elegant coffeehouses here, installed a microcomputer, it was more a symbol of progress than a rejection of traditional thinking.

The micro installation turned out to be both an enlightening experience and a financial blessing, he said.

As in scores of similar businesses, old cost guidelines no longer apply in baking. Here the cost ratio of labor to materials once was 1:2, but now is almost reversed. This new economic standard was the primary factor in Vernimb's decision to purchase a microcomputer, he indicated.

The cost of raw goods, according to Vernimb, has also changed drastically. For example, one ingredient — chocolate — has increased 250% in price, spurred by today's economic and agricultural conditions. Amidst this turmoil, it was imperative that a method to keep track of a permanently stored inventory with variable prices be implemented. What was missing, however, was a system whose cost would not exceed the benefits it provided.

Recipes on File

After a long and somewhat bewildering search, Vernimb found such a system at Digitronic Computer Systems GmbH, the German representative for Vector Graphic, Inc. of Westlake Village, Calif.

"The system is capable of all possible calculations and is expandable to accommodate other programs at no additional cost," he said.

Vernimb's microcomputer, the Vector 1+, is an 8080-based microprocessor with 64K of core memory and 8K of static random-access memory. "Programming the system was a bit delicate because I was unfamiliar with Basic," he recalled. "However, I could determine the concept of the program, and Digitronic was extremely helpful in programming.

"After several days, the program was finished," Vernimb said. "I tested it, improved it, retested it and finally got what I wanted. Now, I have more than 100 recipes on file and add more every day."

One diskette in his system contains approximately 300 recipes and 500 raw goods items. With that capacity, many half-finished recipes like buttercream or shortbread can be entered into the file of raw goods for further calculations.

"It is very important that a disk system be used, because the access time is only a split second," Vernimb noted. "If a tape-based system were used, calculations might take as

(Continued on Page 74)

Basic-Based Desktop System Features Built-In Peripherals

LOS ANGELES — A desktop computer introduced by Compucorp incorporates in a single package a CRT, memory and hardcopy peripherals that are usually packaged separately.

Named the 625 Mark II, the system is aimed at scientific and business users.

The 625 Mark II is based on the Zilog, Inc. Z80 central processor and is offered with an extended Basic language operating system and up to 60K bytes of internal random-access memory (RAM). Dual flexible disk drives, which can be used for both program and data storage, store up to 630K bytes of data, the firm said.

The unit contains a 1,280-character CRT as well as a 40-column alphanumeric matrix printer. The printer can provide multiple copies on plain paper and features variable character sizes, Compucorp noted.

Five board slots are provided inside the unit for a variety of interface options, according to Compucorp. The system can be used as an instrumentation controller by inserting the IEEE-488 bus option or any of four other controllers.

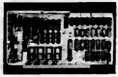
Compucorp 625 Mark II

Other interfaces include an analog-to-digital/digital-to-analog interface with an internal multiplexer and a 32-line parallel interface. A dual serial communications controller is also available.

Prices for the 625 Mark II start at $8,000. Compucorp is at 1901 S. Bundy Drive, Los Angeles, Calif. 90025.

Switch-Programmable Ports

I/O Board Built for S-100 Units



The Switchboard

BERKELEY, Calif. — Thinker Toys has introduced the Switchboard, an I/O board for S-100 systems that has four parallel ports and two RS-232/teletypewriter serial ports plus strobe and attention ports.

The system has options for 4K bytes of random-access memory (RAM) and 4K bytes of erasable read-only memory.

Every port is switch-programmable for flexibility in interfacing various types of peripherals, the firm said. Each parallel port can be switched for input or latched output.

Both serial ports can be switched and the strobe and attention port flip-flop can be switched also for positive and negative pulsing.

The Switchboard costs $199 in kit form and $259 assembled from Thinker Toys, 1201 10th St., Berkeley, Calif. 94710.

Imsai Unveils Hard Disk System

SAN LEANDRO, Calif. — Imsai Manufacturing Corp. has introduced the HD-10, a hard disk system that features the Control Data Corp. Hawk Model 9427H hard disk.

The HD-10 provides 10M bytes of formatted on-line storage per unit and has a random-access time under 35 msec, the firm said.

The 9427H is a high-performance random-access storage device and is accompanied by an industry-standard 5440-type removable disk cartridge which provides an additional 5M bytes of storage.

Compatible with all Imsai 8080- and 8085-based microcomputers, the HD-10 employs a single S-100 bus I/O board to interface with up to two external disk controllers. Included with the system is the firm's Imdus II operating system.

Any applications written under Imdos will run under Imdos II, with little or no modification, according to the firm.

The HD-10 system costs $9,995 from Imsai Manufacturing, 14860 Wicks Blvd., San Leandro, Calif. 94577.

Micro Offers Modern Tool

(Continued from Page 73)

much as two hours because the complete tape must be run to find an item and then rewound. "In fact, it only takes eight seconds to calculate a recipe from a disk system."

With Vector Graphic's system, a second diskette can increase the capacity to 1,000 recipes. The advantage here is that the prices for raw goods have to be changed on only one diskette, because it has a capability of transferring the corrected prices in a block.

Recipes are entered with the respective labor cost listed in fractions of an hour. Working hours are calculated by dividing effectively used hours into the bakery's total cost of overhead, then entered into the raw goods file.

Once programmed, the integrated system can perform numerous calculations of cost and can correct past errors via error detection programs.

"The system gives me the information to make faster, more effective decisions," Vernimb said. "It has become crucial to running my bakery."

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Cases Hold TRS-80

LYNBROOK, N.Y. — A matched set of custom-built cases to carry, protect and store the Radio Shack TRS-80 microcomputer system is available from Ambico, Inc.

One case holds the micro's 12-in. video monitor and the other holds the keyboard, cassette machine, power supply, cables, cassettes and accessories. The suggested retail prices are $35 for the large case and $25 for the smaller case. Ambico is at 101 Horton Ave., Lynbrook, N.Y. 11563.

Supplies Available From Rove Industries

SHERMAN OAKS, Calif. — Users can now obtain magnetic media, printer ribbons and other microcomputer supplies from major manufacturers through Rove Industries.

Magnetic media includes diskettes, minidiskettes, digital cassettes and magnetic cards. The company will also supply preformatted, dual-sided, double-density diskettes for the microcomputer user.

Rove Industries is maintaining a mailing list of users interested in media and other computer supplies to inform them of special prices offered each month on different items.

Requests for the catalog and monthly specials can be sent to Rove Industries, 14279 Greenleaf St., P.O. Box 5209, Sherman Oaks, Calif. 91423.

Cartridge Recorder Offers General-Purpose Interface

SAN DIEGO — Tandberg Data, Inc. has introduced the GPIB 3000, a general-purpose interface bus cartridge recorder using the DC300A/-DC300XL cartridge media.

The interface bus for Tandberg's TDC 3000 digital cartridge recorder allows users of test equipment, calculators and other types of bus-compatible instruments to record on tape.

The GPIB 3000 can be plugged directly into the standard IEEE-488 interface bus available on most measurement instruments.

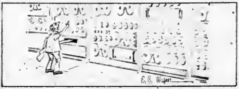
The cost of the GPIB 3000 is $3,620. Tandberg Data is at 4060 Morena Blvd., San Diego, Calif. 92117.

Guide Covers 6800 Systems

ROCHELLE PARK, N.J. — An introduction to programming the 6800 microprocessor has been published by Hayden Book Co., Inc. The book is entitled *The 6800 Microprocessor: A Self-Study Course with Applications* and was written by Lance A. Leventhal.

The publication includes 15 laboratory exercises that emphasize the use of the microcomputer as a controller which responds to inputs and prepares suitable outputs. Some of the exercises cover LED displays, flowcharting, common errors, data arrays, program debugging, subroutines and interrupts.

The book costs $5.95 from Hayden Book Co., 50 Essex St., Rochelle Park, N.J. 07662.



'Don't Tell Me, "To Err Is Human"; You're Not Human.'

U.S. Firms Feel Secure on Taiwan

By Marcia Blumenthal
CW Staff

Although the Carter Administration's decision to sever diplomatic relations with the Nationalist Chinese government and establish diplomatic ties with the People's Republic of China has set off sparks of violence on Taiwan, U.S. companies with operations on the island do not expect trouble.

As one industry observer bluntly said, "The Chinese are not about to let politics affect profits."

IBM has had a sales and service office on Taiwan for the past 20 years, a company spokesman noted, adding that the Taiwanese have been good customers. Although he indicated IBM would like to do business with Peking, he would not elaborate on the firm's perception of how selling to Peking would affect IBM's Taiwanese business.

"Unless the U.S. misbehaves in some foolish ways against Taiwan, everything will most likely go on the same way as before," Trude Taylor, president of Electronic Memories & Magnetics Corp. (EMM), said. "Of course there will be palaver, but that's all."

Taylor estimated EMM has about $10 million invested in its Taiwan plant, from which it ships core memory and semiconductors.

Business as Usual

"Our plant manager is Chinese and we have talked with him every day. He is not pleased about the U.S. action, but it's business as usual there," Taylor remarked.

"Certainly we have products that can be used in the People's Republic of China, and we would like to trade there, but that's a long way down the road," he added. He does not think the restrictions on computer trade with Communist countries will be lifted soon.

Ampex Taiwan, a subsidiary of Ampex Corp.'s Memory Products Division, has had major production facilities on Taiwan for the past 10 years, a spokesman from the marketing organization said. The current political situation will not affect "our operation one iota," he maintained.

Texas Instruments, Inc., has also been on Taiwan for the past 10 years. A TI spokesman would not elaborate on prepared remarks released by the company which said the political situation would not affect U.S. businesses there.

Similarly, Frank G. Hickey, chairman of General Instrument Corp., indicated his company intends to expand operations to Taiwan, and set up a $1 million facility within the next 12 months for the production of telecommunications products.

Commits $800 Million

UK Bullish on Microelectronics Industry

By Rex Malik
Special to CW

LONDON — Eric Varley, British secretary of state for industry, said recently he will have "no trouble" getting total of $800 million from the UK government for a national program of investment in microelectronics industry. The program will include the support of research and development, investment in manufacturing, training and the development of applications.

Various programs under way indicate the UK government has already committed about $600 million to the microelectronics industry.

Prime Minister James Callaghan recently attended a meeting of the National Economic Development Council (NEDC), which has been interpreted as signaling the importance the government attaches to microelectronics development in the UK.

In his comments to the council, the Prime Minister referred to a paper prepared jointly by the ministries of Industry, Employment and Education and Science that discussed the impact of the new technology on the nation's future.

The Microelectronics Industry Support Program (Misp), announced last July, was initially expected to cost about $140 million, but sources believe it was devised to attract a total investment of $400 million [CW, Dec. 4].

Aside from Misp, other support agreements already made by the government or in the discussion stages are estimated to cost another $200 million in direct support.

The major project here is the $100 million funding by the National Enterprise Board of Inmos, a government-owned and publicly funded industrial investment house. Originally conceived to bring back to the UK some of the British talent now working in the U.S., Inmos is involved with creating new devices and new architecture. However,

(Continued on Page 80)

PCC to Service Philips Systems; Philips Halts Marketing in U.S.

LOS ANGELES — Pertec Computer Corp. (PCC) has begun managing North American Philips Corp.'s existing lease base of about 2,000 small business systems. The systems had been marketed in the U.S. by Philips Business Systems, Inc. (PBSI) through 16 independent agents, but the company recently decided not to continue marketing these systems in the U.S.

A PBSI spokesman would not comment on why the company decided to discontinue its U.S. marketing effort. "As to the future, it is still being evaluated," he said.

Under the terms of the agreement between PCC and North American Philips, which became effective Jan. 1, PCC is providing service and software support for PBSI systems. The agreement also calls for the transfer to PCC of PBSI's maintenance obligations for the installed base and the transfer of certain associated software and spare parts for maintenance purposes.

In addition, PCC is now the U.S. distributor of related supplies for PBSI products and will provide spare parts and supplies to the 16 independent agents which marketed the small business computers.

PCC also gained nonexclusive rights to all of PBSI's existing and future application software for these systems.

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Contract Gripes With GSA Agencies?

WASHINGTON, D.C. — Companies that have contract gripes with agencies under the umbrella of the U.S. General Services Administration (GSA) may be able to settle their disputes more speedily because of the Contract Disputes Act of 1978 recently signed by President Carter.

The new law also broadens the jurisdiction of the GSA's Board of Contract Appeals, according to Leonard Suchanek, acting chairman of the board.

A major provision of the act allows a company with a contract dispute to make a complaint directly to the U.S. Court of Claims, Suchanek explained. Previously, companies would have to air their contract grievances before the Board of Contract Appeals before being permitted to bring an action to Court of Claims.

Moreover, contract disputes involving claims of less than $10,000 must be decided on by the board within 120 days; those claims between $10,000 and $50,000 now have a turnaround time of 180 days, Suchanek noted. Prior to the act, there were no established deadlines for the settlement of contract disputes.

The newly enacted law also removes most jurisdictional problems experienced by vendors contracting with agencies under the supervision of the GSA. For instance, in the past, if a vendor did not have a disputes clause in his contract, the claim could only be heard by the Court of Claims.

Now, all firms that have contracts with GSA agencies and have complaints can request a hearing before the board. Most legal distinctions over which complaints the board would hear have been removed.

In describing the duties of the members of the Board of Contract Appeals, Jay Solomon, GSA administrator, likened them to administrative judges, removable only for cause and not subject to the control of government administrators.

SSC Employees To Be Given Firm's Stock

DENVER — In a move to transfer the bulk of its company's ownership from the public to employees, the board of directors of Scientific Software Corp. (SSC) has approved a tender offer to purchase up to 700,000 shares of the firm's outstanding common stock.

"We are a service industry and heavily dependent on attracting and retaining good people," Treasurer William L. Covode said. Distribution of the shares to employees will be part of the pension plan, Covode added.

Although the mechanism for distributing the stock has not yet been decided upon, Covode said the board anticipates the shares will be distributed over a five-to 10-year period by setting up an employees' stock ownership plan (Esop). Currently, employees do not own a great deal of the company's stock.

Under the tender offer, SSC will purchase up to 700,000 shares of its stock for $4 per share payable in either cash or preferred stock. Recently the company's shares, traded over the counter, closed at $2.50 per share bid and $3 per share asked. The offer excludes SSC employees who own shares of the company's stock.

Under the proposed tender offer, shareholders of record on Nov. 30 who own less than 1,000 shares of SSC stock will receive $4 in cash for each share owned, according to SSC President Dr. E.A. Breitenbach. Tenders from this group will be accepted first.

The next group of stockholders, those with 1,000 or more shares, will be paid $2 per share in cash, plus $2 of a new issue of 8% preferred stock for each 50 shares tendered.

The tender will be dependent on reducing the number of common stock shareholders to less than 300, Breitenbach said. That way, the reporting requirements of the Securities and Exchange Commission for publicly owned companies would not apply, he explained.

SSC has scheduled a special shareholders' meeting to approve the issuing of the 8% preferred stock involved in the stock purchase plan.

Specializing in software for the oil and gas industries, SSC began trading its stock publicly in 1968 and has not issued stock since then, Covode noted. There are presently about 1.2 million shares outstanding. If the 700,000 shares are tendered as planned, about 500,000 shares would still be outstanding, but a sizable portion of those shares is owned by company employees, Covode said.

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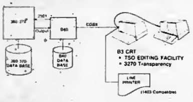

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To Top $52 Billion

Net Increase of 3% Predicted for R&D in '79

COLUMBUS, Ohio — U.S. research and development expenditures are expected to top $52 billion this year, according to Battelle's Columbus Laboratories' annual R&D survey.

The 1979 prediction represents an 11.1% increase from 1978 expenditures, but because of inflation, Battelle forecast the actual increase in R&D would be 3%. However, that increase represents the highest R&D investment of the decade, Battelle noted.

The boost in R&D investment will result in part from a more sophisticated view of its relationship with innovation and growth, according to the study's author, Dr. W. Halder Fisher, a research economist with Battelle. In the past, "most statements concerning the sources of technological change and economic growth tended to be somewhat naive, placing emphasis on a conceived need for more R&D expenditures," the report observed.

Using Foreign Discoveries

While research is required to expand scientific horizons in the U.S., it is a mistake to think this research must be totally domestic, the report stated. "Many of the more noteworthy U.S. innovations have involved adaptations to mass-production and mass-marketing of foreign discoveries."

The federal government will supply about $25.7 billion or 48% of the total R&D funding during 1979, with industry footing $24.9 billion and non-profit organizations and academic institutions rounding out the expenditures.

Although industry will provide only 47.5% of the R&D funds, it will perform 71.2% of the research, the study noted. In fact, R&D funding in the industrial sector is expected to increase 14.6% from 1978 funding levels and perform 12.6% more of the actual research and development.

Echoing remarks made by Dr. Jordan Baruch, assistant secretary for science and technology at the U.S. Department of Commerce [CW, Dec. 18], the report concluded that in order to optimize R&D accomplishments in the U.S., "both government and industry will have to undertake deliberate and creative changes in both their [R&D] management and policy criteria . . . and as a nation, we must take full advantage of available foreign technologies."

Baruch's comments were made to a group of industry executives attending the winter meeting of the Computer and Communications Industry Association (CCIA).

The Commerce Department will be holding symposia later this month, addressing the problem of industry innovation.

Until this year, the report broke out R&D expenditures by specific industry categories, including the computer industry. Part of the data for these industry categories was supplied by the National Science Foundation (NSF). However, this year industry response to the NSF survey was poor because corporate accountants responsible for sending figures to the NSF often fail to see the importance of the survey, the report noted.

The report is available free of charge by contacting Battelle at 505 King Ave., Columbus, Ohio 43201.

Commerce Slates Seven Sessions

Meets to Explore Industry Innovation

WASHINGTON, D.C. — Secretary of Commerce Juanita M. Kreps has scheduled seven public symposia on the issue of industry innovation to be held here Jan. 15-25.

These public meetings are part of the domestic policy review of industrial innovation being undertaken at President Carter's request.

Dr. Jordan J. Baruch, assistant secretary for science and technology at the Commerce Department, will chair the meetings, which will consist of both formal presentations and informal discussions.

Last month Baruch spoke to a group of industry executives attending a meeting of the Computer and Communications Industry Association (CCIA) [CW, Dec. 18]. At that meeting, he explained that the Commerce Department was charged by President Carter to develop policies which will spur industrial innovation in the U.S.

Baruch noted that the government, in developing its final policies on innovation, would permit policies which targeted particular industries.

A 75-member advisory committee, comprised of executives representing a variety of industries, is now formulating policy recommendations that will be reviewed, revised and sent to the President on April 2.

The symposia are part of this review process, and each session will run a full day. The schedule of sessions is as follows. Procurement: Jan. 15; Direct Support of R&D: Jan. 16, Environment, Health and Safety Regulations: Jan. 17; Regulation of Industry Structure and Competition: Jan. 19; Economic and Trade Policy Jan. 22; Patents: Jan. 24, and Information: Jan. 25.

The symposia will be held in the Department of Commerce auditorium in the Commerce Department building.

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To Tackle Common Problems

Dealers of IBM Gear Unite in Western Europe

By Marcy Rosenberg
CW Staff

HEIDELBERG, Germany — A group of companies that buy, sell or lease new and used IBM equipment in Western Europe has formed an association to tackle certain problems faced in doing business with IBM.

By addressing these problems as a group, the European Computer Trading and Leasing Association hopes to expand the Western European market for used equipment and equipment purchased from dealers and third-party lessors, according to Lawrence C. Erdmann, director of international operations for IPS Computer Marketing in Fort Lee, N.J.

His firm joined the association because "we do significant business in Europe" through a Swiss subsidiary, Erdmann said.

"Although association members are competitors, we also trade with each other and have common problems," he noted. "We all have difficulties with IBM."

Pricing Problems

One such difficulty is IBM's European pricing policy. While the firm's prices are freely available in the U.S., IBM price lists are hard to come by in Europe, Erdmann maintained.

"As a matter of policy, IBM does not publish prices anywhere in Europe and its prices vary from country to country for comparable equipment," Erdmann said. He added that prices are most difficult to obtain in France and Germany — countries that, along with England, have the largest base of IBM equipment in Europe.

"European customers can only find out piecemeal what IBM chooses to tell them, but do not know general prices," he noted.

These pricing practices confuse dealers and users. Dealers don't know whether their prices are competitive with IBM's, and users aren't able to shop within IBM's price list — something they would have to do to evaluate the dealer price and take full advantage of the used equipment market, Erdmann added.

Discussion Sought

The association intends to invite IBM industry relations managers to one of its meetings in the near future to discuss these problems and to try to get a European equivalent of the consultants' manual IBM publishes in the U.S.

In addition, the new organization will work to clarify certain IBM practices that benefit users when they buy equipment from dealers. For example, under its universal transferability of maintenance policy, IBM will accept for maintenance new and used equipment purchased from dealers even if the equipment moves across national borders.

This policy is "misrepresented from time to time by IBM salesmen in Europe," Erdmann contended. "We want to assure users that they take no risk when they buy through a dealer."

Also, he added, European dealers and users generally do not know that IBM will install new equipment in any country, regardless of where it is purchased. This policy benefits European dealers who buy equipment from IBM in the U.S., where IBM prices generally are lower than in Europe.

Other association objectives call for establishing a code of business ethics for the lease, purchase and sale of computers to end users to Europe and for trading equipment among members.

"We want to promote the price and delivery advantages of dealing with us as an industry," Erdmann said. "The price differential between new and used computers can be as much as 50%.

"We also can provide faster delivery — from one week to a few months — compared with many months to a year from the manufacturer."

The U.S. market for used computer equipment is estimated at over $1 billion and growing at a 30% annual rate, while in Europe that market ranges from $250 million to $300 million, increasing at 40% to 50% a year. "By forming the association and carrying out its objectives, we want to spur that growth rate even more," he added.

So far, 17 companies have joined the association.

IBM's Stance

Asked about its European pricing policies, an IBM spokesman said, "We don't see any business need to make price lists generally available in Europe."

A prospective customer in Europe receives pricing information for the equipment and kind of transaction — whether lease or outright purchase — for which he's a prospect, he added.

The spokesman confirmed that IBM prices "may vary from country to country in Europe." The reason, he said, is that "IBM companies in those countries may deal with many business factors — for example, the cost of doing business — and those factors can vary from country to country."

Additional information on the European Computer Trading and Leasing Association can be obtained from Erdmann at IPS Computer Marketing, 2460 Lemoine Ave., Fort Lee, N.J. 07024 or from Peter Doyle, the group's interim chairman, at Premier Computers Ltd., 3 Union Court, Richmond, Surrey, London, England.

UK Puts $800 Million Into Microelectronics

(Continued from Page 75)

business plans for Inmos — the brainchild of Iann Barron, founder of Computer Technology Ltd.— are being kept under wraps, sources said.

The Inmos arrangement led indirectly to the conclusion of the long-awaited deal between Britain's General Electric Co. Ltd. and Fairchild Camera and Instrument Corp. to establish a high-volume manufacturing operation in memories and microprocessors in the UK. The operation will initially produce Fairchild-designed devices.

Cause of Confusion

Regional aid will also be given to companies setting up microelectronics ventures under Misp, particularly if those companies are willing to invest in parts of the country that are relatively underdeveloped or have high unemployment rates. Regional grants will cover the cost of buildings, training and R&D, among other items.

It is these regional grants that have caused confusion over the amount to be invested, which led to the $800 million figure alluded to by Varley.

The aid is not all concentrated on high-volume production. The ministerial paper referred specifically to projects designed to encourage companies to devise applications for microprocessors.

The Microprocessor Applications Project (MAP) within the Department of Industry has already been funded for $30 million.

The Prime Minister also used the NEDC meeting to announce the expansion of the MAP scheme, with funds increased to $110 million. In addition, he announced that $70 million would be spent on educational initiatives and $50 million on training. This is the extra $200 million that raises the total investment to $800 million.

The major thrust of the retraining program is to train an additional 3,000 analysts and programmers by late 1979.

The period over which the aid is to be paid has not been announced. The MAP and Misp plans, however, are expected to run over a three-year period.

The aim of the various projects is not solely a "new industrial order," but is also concerned with trade balances. Britain's share of world trade in electronic components was 5.6% in 1977.

However, the UK had an adverse balance of trade of $470 million for the year.

The program is therefore also aimed at assuring the UK of a share of world trade and containing imports, which are growing at about 15% per year.

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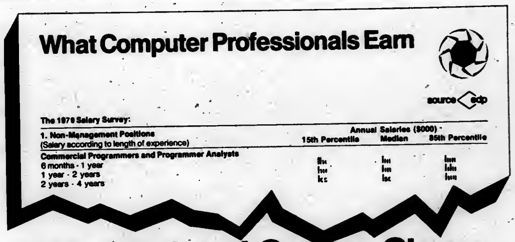

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Software Opportunities

in New England

For many years the New England area has been widely acclaimed as the nation's leader in technological development and research. Today, universities and companies throughout New England are advancing state-of-the-art technology in many fields at an unprecedented rate. This tradition of technological leadership and continuous growth has created a professional career environment unmatched anywhere in the country.

During the past fifteen years E.P. Reardon Associates has been one of New England's most successful professional placement services. Our client list includes most of the major computer mainframe and minicomputer manufacturers in the country as well as many peripherals and application-oriented companies. Some of the fastest growing companies in the industry are located in the New England area.

We have been retained by one such company to assist them in their nationwide search for talented technical professionals - individuals who thrive on challenge and aren't afraid of a fast pace.

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The leader in one of the fastest growing segments of the graphics art industry. NYSE listed, this company has sustained 30-40% annual growth for a number of years. Continued growth and expanded career opportunities are assured as our client maintains its leadership in the development of state-of-the-art technology and expands it's foreign market penetration.

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Headquartered in the Suburban Boston area, you will enjoy all the benefits of living within easy commuting distance of the many nationally recognized Universities, hospitals, cultural and recreational facilities which abound in this area while being able to choose from a wide variety of life styles and living accommodations. Of course, our clients' comprehensive employee benefit package includes full relocation coverage as well as all interview expenses.

POSITIONS

SOFTWARE STAFF ENGINEERS 30-35K

Will be responsible for defining new product requirements for both domestic and international markets. Evaluate hardware/software interface, time vs. cost and cost/performance trade-offs. Supervise staff of programmers, analysis and technicians. Experience must include micro-processor software design exp. and previous project management.

SENIOR PROGRAMMER 22-25K

Design and implement a broad variety of micro processor software systems and subsystems. The successful candidate will have an appropriate degree and 2-5 years assembly language programming experience in a real-time environment. Excellent promotional opportunity for individual seeking supervisory responsibilities.

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Excellent opportunity for recent college grad. (Comp. Sci./Math or E.E.). Will participate in coding, assembling, debugging and testing a number of software subsystems. Assembly language experience and/or courses required.

ASSOCIATE SOFTWARE ANALYSTS 22-25K

Requires bachelors degree (or equivalent experience) and experience writing and executing test procedures in real time environment using minis/micros. Familiarity with PLM a definite plus (but not required). Excellent opportunity for individuals with hardware knowledge and programming interest.

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Newly-formed international products group. Experience, at either systems or applications level, with text-editing software is required. Structural programming knowledge essential. Leads to project management. Degree preferred.

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to 25K

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If you are interested in exploring these career openings and would like to be associated with one of the fastest growing, most technically challenging companies in the industry, call Dan Meagher, (617) 329-2660, or forward a copy of your resume to him. All inquiries will be answered within 48 hours and will be treated in complete confidentiality.

Client companies assume all interview and relocation expenses.

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Hanes Hosiery, a division of Hanes Corporation — a Fortune 500 Company with Headquarters in Winston-Salem, N.C. — has openings for systems planning and development personnel.

This position requires significant experience in a large scale installation, preferably utilizing on-line systems, transaction processing software, and data base management. Candidate should have a college degree and a minimum of 4 years total D.P. experience with at least 1 year as a Systems Analyst.

This position offers excellent opportunity for professional growth through participation with a top staff of EDP professionals in the continued development of sophisticated management information and planning systems. We utilize large scale Honeywell equipment with the latest in operating systems, transaction processing software, communications network, and data base management.

If you feel that you qualify, please send resume including salary date in confidence to:

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SENIOR ANALYST

must be completely knowledgeable of COBOL, experience in data base management, graphics programming, and TSO terminal usage helpful. Experience with UNIVAC 90/30, OS-3, and IMS-90 helpful. Duties will include the creation and maintenance of an on-line MIS system. Please submit resumes stating salary requirements to the Southwest Florida Water Management District, 5060 U.S. Highway 41 South, Brooksville, FL 33512 EOE M/F

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Major manufacturer of lawn and garden equipment needs a Programmer/Analyst with at least 2 years RPGII experience and a sound working knowledge of CCP. Equipment is a large IBM System 3, Model 12 utilizing CCP and MRJE. We offer an attractive compensation package including excellent benefits and advancement opportunity. For confidential consideration, forward resume detailing past experience and salary requirements to: R M. Kreikamp, J I Case Co., O.P.E. Div., A Tenneco Co., 119 S. 1st St., Winneconne, WI. 54986. 414-582 4455. An Equal Opportunity Employer.

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You must possess a BS in Computer Science or the equivalent. In addition, you will need 3-5 years experience in assembly language programming, preferably PDP-11 MACRO, in the areas of communication, remote terminal emulation, and workload characterization.

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Data General

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(New England)

Data General, one of the industry's leading computer systems manufacturers, is seeking a Regional Systems Engineering Manager located in Wellesley, MA.

As Regional Manager you will work closely with our sales management team in planning strategies for our entire pre-and post-sales software support activities for both our commercial end-user and OEM customers. In addition, you will be responsible for selecting, training and motivating a force of Systems Engineers located in New England through subordinate District Managers.

As a successful candidate you should have second level management experience managing professional data processing personnel in a minicomputer vendor or end-user environment. You should also have a strong technical background in computer systems or applications development and possess excellent customer liaison skills. As a member of our management team you will become a vital part of a nationally known sales force helping to market a broad spectrum of competitively priced and compatible computer systems products.

We offer a highly competitive compensation/benefits package including automobile allowance plus the potential for an attractive bonus. In addition, you will be provided with the opportunity for advancement that only an industry leader with ten years of continued progressive growth can provide.

To discuss this opportunity call Joanna Flint, Area Personnel Manager, collect at (617) 235-8171 or send your resume, including salary history, in confidence to her at Data General Corp., 888 Worcester Rd., Wellesley, MA 02181.

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If you're a software technical writer with experience in **PDP-11, RSX-11, DG NOVA, RDOS, IBM 370, H-6000, in COBOL, FORTRAN PL/1 or ASSEMBLY** Languages, send us your resume right away. And land a position that's right up your alley.

Qualified applicants are invited to contact our office, in strict confidence, at (617) 861-1020, or to submit confidential resume with current salary information. All replies will be acknowledged. For those who find it inconvenient to call during working hours, our office will be open until 7:30 p.m. Client companies assume all fees.

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Due to the rapid expansion in its' Data Processing Division, American Bank and Trust Company in Baton Rouge, La. has immediate openings for experienced programmers and senior programmer/analysts working in a Burroughs medium systems environment utilizing on-line programming techniques.

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Interactive Information Systems
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PROGRAMMER ANALYST PROGRAMMER

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Please send your resume, including salary history, in confidence to Tony Maglione, Data General Corp., (A-50), 15 Turnpike Road, Westboro, MA 01581.

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Rapidly expanding consulting field offers opportunity for experienced individuals with strong LIFE or PROPERTY and CASUALTY background. If you like dealing with people, have a strong data processing insurance knowledge and enjoy some travel, several openings exist from SR INSURANCE ANALYST thru TECHNICAL MARKETING and SR ACCOUNT MANAGER. Salary range is $20,000-$35,000.

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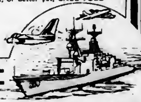

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Data Processing Opportunities

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SYSTEMS ANALYST
PROGRAMMER ANALYST
PROGRAMMERS

We are a highly successful retail chain headquartered along Lake Michigan in the beautiful western Michigan area.

Our corporation is growing to meet the needs of our farm and suburban customers in a 3 State area. An important part of that growth is a contribution your talents can make. We are looking for individuals with varying degrees of experience in Systems Design and Programming. If you relate well with people, are interested in a growth opportunity and want to join a progressive company, we would like to hear from you. If interested please send your resume or a brief letter indicating your previous experience and salary requirements to:

Director of Personnel Services
QUALITY FARM & FLEET, INC.
1460 Whitehall Rd.
N. Muskegon, Michigan 49445

AN EQUAL OPPORTUNITY EMPLOYER M/F

PROGRAMMERS

South Florida Opportunities

LOCAL INTERVIEWS CLEVELAND

Racal-Milgo, Inc., headquartered in South Florida is a world leader in the data communications field. In order to keep pace with our record sales and continued growth we have opened career opportunities at all levels for Programmers interested or involved in software development. These positions include the following:

SOFTWARE DEVELOPMENT

SYSTEMS PROGRAMMERS

These positions involve systems design and development of communications networks, familiarity with PDP-11, RSX 11M, RT 11 and microprocessor based systems. Intel 8080, 8085 experience is desired.

REAL-TIME APPLICATIONS PROGRAMMERS

Responsibilities include functional design and implementation of application related to the control of communications devices. This software will perform switching and controlling of communications network systems.

ENGINEERING PROGRAMMERS

Your involvement will include microprocessor . operating systems design, communication software development, real-time software design, compiler design, terminal development, multiplexer software design.

APPLICATIONS PROGRAMMER

Should have a minimum of 2 years real-time assembly language experience in minicomputers or microprocessors, communications, teleprocessing, remote batch, IBM 3270/2260, Uniscope 100/200/400, VIP 7700 exposure helpful.

MANAGEMENT INFORMATION SYSTEMS

SYSTEMS SPECIALIST

Individual we are seeking should have 3 to 5 years systems analysis and programming experience with business applications utilizing ANS/COBOL. Experience in Univac 1100 series and degree preferred.

DATA BASE ANALYST DESIGNERS

Duties include analysis design and development of data bases for both batch and on-line applications utilizing DMS 1100 data base management systems. You will also be responsible for training, consultation, performance measurements and optimization of data base designs.

To arrange for a confidential local interview call Rod Manning collect at (216) 524-8050, Sunday, January 7th, 2 p.m. - 8 p.m. and Monday, January 8th, 9 a.m. - 5 p.m. If unable to call please submit your resume to:

Racal-Milgo

8600 N.W. 41st St., Miami, FL 33166 (305) 592-8600

Equal Opportunity Employer

RACAL
The Electronics Group

PROGRAMMER ANALYST

Two years experience with Burroughs Medium System preferable, or wholesale grocery experience with extensive business application. Must be proficient in use of COBOL language. Profit sharing and excellent company benefits.

Send resume and
salary requirements to:
Personnel Department
PO Box 2237
Tacoma, WA 98401.

Minority applicants shall be considered on the same basis as nonminority applicants without regard to race.

SYSTEMS PROGRAMMERS

—Call Now—

Marathon Oil Company has opportunities for Systems Programmers who have experience on large scale IBM 370 Systems.

We are seeking candidates:

- Who have experience in HASP, SVS, JES2, MVS, or any combination.
- Who are seeking high visibility in a performance-oriented environment.

Interested? Pick up the phone NOW and call:
John J. Schwepe, Manager, Operations Software Department. Please call collect 419/422-2121, Ext. 2951. (8:00 a.m. to 5:00 p.m. EST) or 419/422-7269 (after 5:00 p.m EST).

These positions are located in Marathon's General Offices in Findlay, Ohio, and offer a salary commensurate with education and experience and a complete benefits package. Principals only, no agencies.

MARATHON **Marathon Oil Company**

An Equal Opportunity Employer

PROGRAMMER/ANALYST

Be Seen By The Best....

M.I.S. International has grown as a successful, highly regarded software service company because of the efforts and expertise of creative and ambitious professionals looking for a true challenge. Our real time, on line prouducts and services include customer education, data base management, on line warehousing, data acquisition software, and turn key systems. In the long run, we believe the only question is . . .

If You Are The Best, Why Not Work For The Best?

We have current openings for:

- Business System analyst/programmers experienced in COBOL, PL/1, IMS, DMS, IDS.
- Real Time programmers/engineers experienced in micro/mini computers.
- Engineering analyst/programmers with time sharing experience.

We have an excellent starting salary for those with demonstrated expertise; regular increases are based on individual merit. Our benefit package is second to none, and relocation costs are provided. If you think that individual effort is important, and want to work for a company that agrees with you, call or send your resume to Mr. Ed Lyons.

M.I.S. international, inc.

31350 Smith Road, Room "C"
Romulus, Michigan 48174
(313) 326-7010
An Equal Opportunity Employer M/F/H

software engineers

IF YOU HAVE:

- Experience with the KOMAND job accounting program products (highly preferred) or any other SMF-based job accounting system
- Substantial knowledge of OS/VS internals
- Assembler and COBOL programming experience
- The ability to function with a minimum of direction
- An understanding of a customer's needs and the willingness and desire to work with him

WE OFFER:

- An excellent location only thirty miles west of the nation's capital in suburban Northern Virginia
- A professional, relaxed, and non-political environment
- Excellent salaries and benefits
- A desirable amount of travel (4-6 days per month)
- Full relocation expenses
- An opportunity to grow both as an individual and as part of a prominent company in the rapidly expanding software industry

Please send your resume in confidence (including salary history) to Dick Arnold, Pace Applied Technology, 7900 Sudley Road, Manassas, VA 22110 or Call (703) 369-3200.

PROGRAMMING • ANALYSIS
PACE
CONSULTING • EDUCATION

PACE Applied Technology, Inc.

MIS MANAGER

NCR Corporation a world leader in developing and manufacturing complete Computer Systems is currently seeking an MIS Manager for its Columbia, South Carolina location. The position will report directly to the Divisional Controller and requires a minimum of 7 years progressive experience working in a manufacturing environment with a strong EDP background in Operations and Systems Design.

The qualified candidate should have a strong technical background in manufacturing computer applications, such as: MRP, BOM, Inventory Control, Financial, Order Entry and work in process tracking. Technical skills should include experience in both batch and real-time environments along with a working knowledge of COBOL and NCR NEAT languages.

This is a highly visible position within NCR and requires strong communications skills and leadership qualities. B.S. Degree required, MBA a plus.

For immediate consideration, please send resume and salary history to: Mr. Ken Uhlig, Engineering and Manufacturing, NCR Corporation, Dept. C50, 3325 Platt Springs Road, West Columbia, South Carolina 29169.

NCR
Complete Computer Systems

An equal opportunity employer

Section Chief
Oncology Data Center
Division of Radiation Oncology

Large midwestern university-affiliated radiation therapy division seeks a qualified individual with a doctorate in Computer Science, Physics, Statistics, Operations Research, etc. for an academic appointment to head the Oncology Data Center.

Applicants should have experience in the medical information processing field, have strong research interests and the ability to attract grant support. Main responsibility is to provide computer support and develop innovative systems for health care delivery and research. Must be willing to assume responsibility for a variety of existing computer systems and applictions and manage a group of over a dozen technical support individuals. Excellent fringe benefits including a retirement program. Interested individuals should contact:

Dr. Carlos Perez
Director, Division of Radiation Oncology
Washington University School of Medicine
4611 Forest Park Blvd.
St. Louis, Missouri 63108
(314) 454-3134

Equal Employment, Affirmative Action Employer M/F/H

COMTEN, INC...

We're the company who has quietly become one of the fastest growing firms in the data communications industry. This excitement stems from our major product emphasis in the areas of "front end" communications computers and performance measurement for computer systems. As COMTEN's product innovations continue to gain worldwide acceptance, our sales and earnings are increasing at a rate of 40% a year. That means your future growth with us can be virtually unlimited.

Multiple openings in our regional offices of SAN FRANCISCO and LOS ANGELES include:

SYSTEMS ANALYSTS: Provide pre-post sales support in the installation and maintenance of COMTEN communication software. Enjoy the contact and variety of designing and developing client telecommunications access methods and 2-3 years experience in BAL programming required.

CUSTOMER SERVICE REPRESENTATIVES: Assume independent maintenance of the newest in data communications hardware and software. At least 2 years experience in systems installation and maintenance desired.

MARKETING REPRESENTATIVES: Opportunities for professional sales representatives with at least 5 years experience in data communications field, IBM 360/370 and emulation knowledge. Excellent territory, salary, commission and bonus plan.

To pursue this career opportunity we encourage you to submit a resume including salary history and geographic preference to Bob Topper:

COMTEN, INC.
9481 Airport Boulevard
Suite 830
Los Angeles, California 90045

COMTEN

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Houston's premier dp recruiters have a great opportunity for you! We're specialists in career advancement!

the DPCenter

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Houston, Tx 77027

DPC

or call us at
(713) 960-9102
to discuss the Houston
or national job market

National representation through the Data Processing Careers and Computer Talent Source personnel networks

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Programmers, Analysts, Software Specialists

We are Specialists Too!

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(213) 986-4400

ANDERSON - TAYLOR
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Exton, Pa. 19341
(Philadelphia area)
(215) 363-1603

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STOCKTON STATE COLLEGE

Computer/Information Science Positions for Spring or Fall

Instructor or Assistant Professor — two positions available. M.A. minimum, PhD. candidates in Information Science/Psychology or related fields preferred. Teaching duties include computer languages, information systems, information theory, and human information processing at the undergraduate level. Starting salary: $11,633-13,722 (Instructor); $14,505-16,881 (Assistant Professor).

Professor/Associate Professor — Ph.D. and minimum of five years experience in teaching languages (APL, COBOL, FORTRAN), operating systems, data base management at the undergraduate level. Starting salary: $17,632-20,276 (Associate Professor); $21,433-24,648 (Professor).

Stockton State College is located in southern New Jersey, 12 miles west of Atlantic City on a rustic 1600-acre campus; it enrolls approximately 4500 students. Resume by January 15, 1976 to Dean Theodore Marten, Professional Studies, Box 7600, Stockton State College, Pomona, N.J. 08240 Stockton is an equal opportunity/affirmative action college.

Opportunity To Live In Sunny Southern Florida

ANALYST/PROGRAMMER

Position offers ground floor opportunity for development of on-line, real-time, interactive systems; move into newly constructed Data Center. We offer excellent salaries, fringe benefits. Relocation paid.

We seek at least two years solid EDP experience including COBOL and Telecommunictions; ability to work and communicate well with both EDP and user personnel.

Special consideration give to applicants with any of the following experience:

Honeywell 6400, GCOS, Real Estate, Service Bureau

Send resume in confidence with present and expected salary to

Mr. T.C. Johannes Vice President
P.O. Box 16126
West Palm Beach, Florida 33466

Equal Opportunity Employer

COMPUTER SPECIALISTS — SYSTEMS ANALYSTS — ENGINEERS (EE ME) — FINANCIAL — SALES AND MARKETING — ENGINEERING AND EDP MANAGEMENT

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CONTROL DATA CYBERSEARCH INC

INDEPENDENTS

FORTUNE 50 CONSULTING

We're a leading midWest DP services firm currently working on long term system and program development projects for one of the world's largest manufacturing concerns, not to mention our other requirements. These projects call for professionals with broad experience in the utilization of COBOL or PL-1 under IBM OS/VS and IMS or CICS. Candidates must be capable of stepping immediately into significant responsibilities.

For more information on these midwest-based, long-term assignments, send resume to:

CW BOX 1803
797 Washington St.
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PROGRAMMER ANALYST

(Denver Colorado)

Fast growing wholesale food company has an immediate opening for a Programmer Analyst with minimum 4 years experience in COBOL and ASSEMBLER languages for use on a DOS 360 model 50 system. Responsibilities include designing and maintaining both batch and on-line applications. Knowledge of inventory and accounting packages are a plus. Excellent fringe benefits. Salary range $17,000 to $18,000. Send resume and salary history to Industrial Relations:

WESTERN GROCERS
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Computer Center Director

Modern international agricultural research institute in West Africa, soon to be equipped with a DEC PDP-11/70, requires director to manage computer center and coordinate management and scientific information systems activities. Initially, position requires direct hardware and software involvement.

Qualifications — Management or computer related technical degree, strong management and computer systems experience, strong sense for research environments, and familiarity with DEC PDP-11 configurations. Salary and benefits competitive.

Send resumes to CW Box 1781
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OPENINGS INCLUDE:

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Main frame or 1st time market word processing hardware
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Support "Shared Logic" or "Stand Alone" WP
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Positions Require Minimum of Three Years Relevent Experience

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Need More?

PROGRAMMER ANA IBM-NCR-Bur-Honeywell-Univac-Mini's	$15-39,000
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PROJECT LEADERS Oil & Gas, Human Resources, Fin, Acct'g	$20-34,900
STAFF POSITIONS Mfg, Fin, Commercial, Tech Support	$25-30,000

Call JIM FLEMING at 713-961-3271 or send your resume to:

ROBERT HALF OF HOUSTON, INC.

"EDP SEARCH SPECIALISTS"
4801 Woodway, Suite 231W
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PROGRAMMER/ANALYST

MINIMUM 3 - 5 YEARS EXPERIENCE USING COBOL LANGUAGE, DATA BASE AND ON-LINE DESIGN. PREFER RELATED DEGREE AND DLI & CICS SPECIFICS. IBM 370-158 DOS/VS ENVIRONMENT. SALARY COMMENSURATE WITH EXPERIENCE. EXCELLENT FRINGE BENEFITS. SUBMIT RESUME WITH SALARY REQUIREMENTS TO:

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Director, Personnel Administration
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For more information, contact or send resume to.
Mark Fuller

CADILLAC ASSOCIATES, INC.
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(312) 346-9400

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expertise essential. Direct activities of 20+ staff through 3 Mgrs. Potential to grow to Director of EDP To $30,000

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w/expertise in DEC product line to service lge client base. Programng exp w/BASIC &/or DIBOL nec. To $27,000

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Help direct installation on nation-wide ON-LINE ORDER ENTRY SYS for div FORTUNE 100 giant. Reqs LGE SCALE IBM/COBOL bkgd. To $25,000

SR. SYS. ANALYST

4+ yrs design & development of HOSPITAL INFO SYS reqd by rapidly expanding teaching MED CNTR $25,000

We welcome company inquiries

For full details of these FEE PAID positions, please call for immediate interview appointment or forward resume to

This is a partial listing

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2000 Market St.
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EDP AND FINANCIAL PERSONNEL . . . EXCLUSIVELY

NELINET, INCORPORATED
(NEW ENGLAND LIBRARY INFORMATION NETWORK)

HEAD OF SYSTEMS & DATA PROCESSING

Assistant Director for Systems: will form a very small d.p. department which is highly specialized for library automation and telecommunications applications.

NELINET coordinates the networking activities of 140 libraries in six New England states, is establishing a telecommunications switching center for these libraries, and will begin developing library automation activities. Network projects include on-line union lists of serials, subject retrieval, special catalogs for members, interlibrary communication, on-line interlibrary loan.

Position is responsible for all d.p., and library automation activities at network offices, including systems analysis, programming, operations and documentation. Present in-house equipment includes DEC PDP-11/45.

Requires a good, hands-on manager, demonstrated excellence in library automation, solid and successful experience in several or all of:

-minicomputers
-data base management
-information retrieval
-MARC II data processing
-text processing
-telecommunications
-project management
-d.p. & communication networks
-advanced programming & analysis techniques

Salary: $30,000 - $40,000

Send resume and references by January 19, 1979 to Ms. Nancy Johnson, NELINET, Inc., 40 Grove Street, Wellesley, MA 02181

NELINET, Inc. is an affirmative action/equal opportunity employer.

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GETS BIGGER EVERY DAY
So there are Immediate Data Base Openings for DMS-1100 Consultants

Sperry Univac is an innovative leader in the rapidly expanding computer industry. Sperry Univac's Technical Services Division is broadening its scope in data base technology to meet the increasing needs of its customers.

This expansion has created immediate opportunities for data base consultants for the design and development of data base systems. Career growth positions are available in the following locations:

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The experience desirable for these exciting positions is one or more years using DMS-1100, QLP, TIP or CMS.

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PROGRAMMER - ANALYST

Minimum 3-4 yrs.. ANSI COBOL with some systems design exposure helpful preferably with 360 or 370 DOS Hardware. Areas assigned will be Inventory Control, Standard Costs, Payroll and Financial. Any exposure to SYSGENS on DOS VS system and installing of LIBRARIAN or PANVALET helpful. Working with Systems Analysts and users individual will be in a position to increase knowledge and promotability to Systems.

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Contact: Charlie Bower
Call Collect - 617-329-2660

Thousands of organizations advertise for hundreds of different positions in Computerworld.

In 1976, for example, 1,218 different companies ran ads in *Computerworld* to look for computer people. This list of advertisers includes just about every type of organization you can think of – and some you might not. Here's a small sample of 1976 recruitment advertisers in *Computerworld* and the type of positions they were filling:

Companies: Honeywell Information Systems, Borden, Marathon Oil Co., Lockheed, The City of Chicago, Sperry Univac, Digital Equipment Corp., Dartmouth College, Princeton University Plasma Physics Laboratory, Data General, Amdahl, Exxon, Gould Instrument Systems Division, Xerox, National Semiconductor, The Chicago Board Options Exchange, ITT Domestic Transmission Systems, Inc., United Brands Co., New England Mutual Life Insurance Co., Greyhound Computer Corp., GenRad, W R. Grace & Co., Firemen's Fund American Insurance Co., Datapoint Corp., National Bank of Alaska, Schering-Plough Corp., Rockwell International, Massachusetts Institute of Technology, Merrill, Lynch, Pierce, Fenner & Smith, Inc., Booz, Allen & Hamilton, Inc., Levi Strauss & Co., Kawasaki Motors Corp., AMF Harley-Davidson, Winnebago Industries, Crown Zellerbach, University of Illinois, The American Bar Association, Flour Corp., Parke Davis, Tennessee Valley Authority, Westinghouse Computer & Instrumentation Division.

Positions: Systems Software Development, Software Analysts, Systems Programmers, Computer Performance Evaluation Specialist, Information Processing Professionals, Mainframe Sales Representatives, Manager, Corporate Information Processing, Computer Scientist, Senior Systems Programmer, Computer Systems Gurus, Professional Large Scale Computer Systems Sales, Computer Sciences/Data Base Engineer/Programmer, Engineers and Programmers for Logic and Systems Design and Testing, POS Applications Analyst, Manager of Floor Operations Support, Computer Communications Network Development, EDP Technical Support, Systems Software Programmer, Computer Leasing Sales, Senior Systems Analyst, Operations Manager, Senior Computer Consultant, Manager of Advertising and Public Relations, Data Processing Manager, Scientific Programmer Analysts, Senior Analysts, Director of Computer Services, Data Base Administrator, Job Set-Up Coordinator, Head of Information Services, Executive Director, Director Computer Services, Distributor Sales Manager, National Marketing Manager, Director of Systems and Operations, Director of Academic Computer Services, Manager of Systems and Programming, Developer of Management Information Systems, Computer Software Scientist, Biomedical Computer Engineer, Computer Services Manager.

And they get results!

Here's what three recruitment specialists have to say about their advertising in *Computerworld*.

"*Computerworld* is more dependable than a local newspaper First of all, when you go into a city paper you're only going to reach the percentage of the population in that area that are data processing people And secondly, you're only going to reach the percentage of DP people who are reading the paper that day. But with *Computerworld*, we can depend on being able to reach qualified data processing people – maybe managers, programmers or analysts, but at least all people in our specialty The response is quantitatively better as well For instance, our first ad in *Computerworld* (for a Kansas City opening) got 45 responses, whereas a comparable ad in the Kansas City paper would have only gotten one or two."

Richard Kramer
President
Electronic Data Personnel
1006 Grand Avenue
Kansas City, MO 64106

"The demand for computer people is even stronger now than it was back in the 'go-go' days of the '60s, particularly at the individual contributor level And *Computerworld* seems to filter through to these people very well – more so, perhaps, than any other publication we've used.

"I might add that Source EDP has used them all. Since 1962 we've become, with 35 branch offices in the US and Canada, the largest non-franchised recruiting firm in North America that specializes in data processing. I think our continued exposure in *Computerworld* is one of the factors that has helped us expand to our present level . . .

"Since it's published on a weekly basis, in newspaper format, I think *Computerworld* generates a sense of urgency that simply does not exist in the typical monthly trade magazine People tend to respond to it much more quickly.

"*Computerworld* also comes out on top in comparison to the many local media Source EDP uses. In terms of cost per response, *Computerworld* is a great deal cheaper than a local newspaper since the latter has a general audience. In contrast, *Computerworld* hits our market – the DP professional – right on the button. It also has a tremendous pass-along factor. Some of our ads generate responses for as long as 4 months after publication. Believe me, if *Computerworld* didn't work for us we wouldn't be in every issue "

Robert C. Trotter
Vice President
Source EDP
100 South Wacker Drive
Chicago, IL 60606

"We believe it pays to advertise in Computerworld. We listed thirteen computer personnel openings and received over three hundred replies from personnel across the country Our responses on each position listing were outstanding. As a group of EDP recruiting specialists, Fox and Associates appreciates the important service Computerworld performs."

Charles M. Fox
President
Fox and Associates Executive Recruiters
229 Peachtree Street N. E.
Atlanta, GA 30303

COMPUTERWORLD
THE NEWSWEEKLY FOR THE COMPUTER COMMUNITY
797 Washington Street, Newton, MA 02160 (617) 965-5800

ENGINEER

Manager Digital Systems Programs

Salary to $45,000

Fortune 50 electrical equipment manufacturer located in large eastern city seeks a success-oriented, innovative individual to head up newly created position of Manager, Digital Systems Programs.

Successful applicant must have a proven managerial background in digital hardware and electrical power systems Your responsibilities will include managing design and application activities related to major digital protection and control systems programs. In addition, you should possess excellent communications skills and ability to interface effectively with all levels of personnel. We offer liberal benefits and relocation expenses.

If you are a creative individual who thrives in an environment of responsibility where finding solutions to critical problems is of the highest importance, please send your resume, in strictest confidence to

B-67, P.O. Box 2068
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Equal opportunity employer, m/f

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CHALLENGE YOURSELF

We have been retained by one of Maryland's leading financial institutions to recruit for Data Processing professionals who are ready to challenge themselves and be rewarded for accepting that challenge.

SYSTEMS ANALYSTS **$18-25,000**
These positions range from junior to senior level. Prefer 1-5 years experience in systems design and implementation. Programming background desired.

PROGRAMMER ANALYSTS **$18-25,000**
These positions range from junior to senior to project leader level. Large scale IBM experience with COBOL and financial applications desired.

PROGRAMMERS **$14-20,000**
Trainee, associate, and senior levels available. Prefer experience in IBM hardware DOS or OS with COBOL.

Our client offers a "state of the art" shop, large scale IBM OS environment with on-going training programs. Flexible working hours with overtime available. Modern benefits a package.

All employment expenses are paid by the company. For details, please contact Ran Nelson at 301/296-4500.

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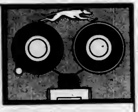

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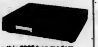

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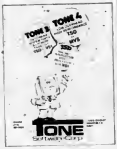

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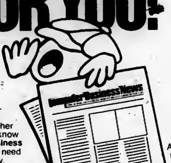

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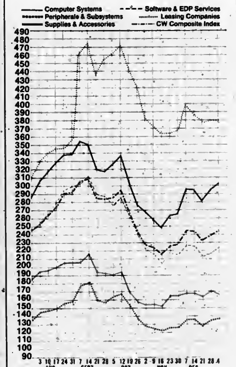

Earnings Reports

ANALOGIC
Three Months Ended Oct. 31

	1978	a1977
Shr Ernd	$.28	b$.20
Revenue	10,637,409	7,695,647
Earnings	939,617	650,302

a-Restated b-Adjusted for a 100% stock dividend paid in September 1978

COMPUDYNE
Year Ended Sept. 30

	1978	1977
Shr Ernd	$.15	$.30
Revenue	45,942,725	44,707,922
Spec Cred		a86,790
Earnings	647,026	1,144,610
3 Mo Shr	.11	
Revenue	11,732,101	12,263,373
Tax Cred		16,697
Earnings	393,110	(12,586)

a-From settlement of debts

COMPUSCAN
Three Months Ended Nov. 30

	1978	1977
Shr Ernd	$.14	
Revenue	4,193,000	$1,741,000
Tax Cred	107,000	
Earnings	301,000	(945,000)
6 Mo Shr	.15	
Revenue	7,512,000	4,501,000
Tax Cred	113,000	
Earnings	314,000	(694,000)

MICRODATA
Three Months Ended Nov. 30

	1978	1977
Shr Ernd	$.60	$.29
Revenue	20,446,000	9,414,000
Earnings	1,353,000	640,000

NATIONAL CSS
Three Months Ended Nov. 30

	1978	1977
Shr Ernd	$.58	$.43
Revenue	16,929,000	12,435,000
Earnings	1,342,000	984,000
9 Mo Shr	1.66	1.22
Revenue	45,105,000	35,874,000
Earnings	3,821,000	2,781,000

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Computerworld Stock Trading Summary

CLOSING PRICES WEDNESDAY, JANUARY 3, 1979

All statistics compiled, computed and formatted by
TRADE QUOTES, INC
Cambridge, Mass 02139

EXCH		PRICE 1978-79 RANGE (1)	PRICE CLOSE JAN 3 1979	PRICE WEEK NET CHNGE	PRICE WEEK PCT CHNGE
	COMPUTER SYSTEMS				
A	AMDAHL CORP.	24- 49	51	- 1/4	-0.4
N	BURROUGHS CORP	59- 87	74 3/4	- 1/8	-0.1
O	COMPUTER AUTOMATION	15- 44	24 1/2	+1 1/2	+6.5
N	CONTROL DATA CORP	23- 44	35 3/8	+1 1/8	+3.2
O	CRAY RESEARCH INC	8- 33	30 1/2	+1	+3.3
N	DATA GENERAL CORP	42- 71	62 3/8	+ 7/8	+1.4
N	DATAPOINT CORP	34- 75	71 7/8	+1 5/8	+2.3
N	DIGITAL EQUIPMENT	39- 55	54 1/2	+1 7/8	+3.5
N	ELECTRONIC ASSOC.	2- 13	7	+ 3/8	+5.6
A	ELECTRONIC ENGINEER.	9- 19	11	0	0.0
N	FOUR-PHASE SYSTEMS	19- 46	33 1/2	+2 1/2	+8.0
N	FOXBORO	28- 40	33	+1 3/8	+4.3
O	GENERAL AUTOMATION	7- 26	17 1/4	+ 1/8	+0.7
O	GRI COMPUTER CORP	1- 3	1 1/4	0	0.0
N	HEWLETT-PACKARD CO	62- 93	91 3/8	+1 3/8	+1.5
N	HONEYWELL INC	43- 73	72 1/4	+ 5/8	+0.8
N	IBM	236-310	306 1/2	+4	+1.3
O	MANAGEMENT ASSIST	9- 29	18 1/2	+ 7/8	+4.9
O	MANUFACTURING DATA S	9- 23	20 1/4	+ 3/4	+3.8
O	MICRODATA CORP	14- 23	19	+ 3/8	+2.0
O	MINI-COMPUTER SYST	4- 8	4 1/4	0	0.0
O	MODULAR COMPUTER SYS	7- 17	14 1/8	+ 1/8	+1.0
N	NCR	37- 67	62 3/4	+ 1/8	+0.2
N	PRIME COMPUTER INC.	20- 43	32	+1	+3.2
N	PERKIN-ELMER	17- 29	28 1/8	+ 3/8	+1.3
N	SPERRY RAND	33- 49	45 3/4	+1 1/8	+2.5
A	SYSTEMS ENG. LABS	11- 24	14 1/4	+ 5/8	+4.5
O	TANDEM COMPUTERS INC	13- 37	26	+1 1/4	+5.0
A	WANG LABS.	12- 32	30 3/8	- 1/4	-0.8
	LEASING COMPANIES				
O	BOOTHE COURIER CORP	13- 21	21 1/2	- 1/2	-2.2
O	COMDISCO INC	5- 22	17 3/4	+3	+20.3
P	COMMERCE GROUP CORP	1- 1	1/8	- 1/8	-50.0
A	COMPUTER INVSTRS GRP.	1- 7	3	+ 1/2	+20.0
O	CONTINENTAL INFO SYS	5- 15	6 3/4	0	0.0
N	DATRONIC RENTAL	1- 3	1 3/4	- 1/4	-12.5
A	DCL INC	3- 5	4 3/8	0	0.0
N	DPF INC	6- 14	10 1/8	+ 1/4	+2.5
N	ITEL	16- 36	26 3/4	+1 1/8	+4.3
N	LEASCO CORP	24- 36	35 1/2	+ 3/4	+2.1
O	LEASPAC CORP	1- 4	2 7/8	+ 1/8	+4.5
P	PIONEER TEX CORP	3- 7	3 1/4	+ 1/8	+4.0
N	U.S. LEASING	13- 20	14 7/8	+ 1/4	+1.7
	SOFTWARE & EDP SERVICES				
O	ADVANCED COMP TECH	1- 2	1	0	0.0
O	ANACOMP INC	8- 22	11 3/4	- 1/8	-1.0
A	APPLIED DATA RES.	8- 17	11 5/8	+ 3/8	+3.3
N	AUTOMATIC DATA PROC	26- 36	30 1/4	- 3/8	-1.2
O	COLEMAN AMERICAN COS.	1- 2	1/2	- 1/8	-20.0
O	COMPU-SERV NETWORK	5- 12	5 1/2	0	0.0
O	COMPUTER HORIZONS	1- 9	6	+ 1/2	+9.0
O	COMPUTER NETWORK	6- 16	7	+ 1/4	+3.7
N	COMPUTER SCIENCES	8- 17	11 3/8	+ 3/8	+3.4
O	COMPUTER TASK GROUP	1- 4	5	+ 1/2	+11.1
O	COMPUTER USAGE	2- 4	2 1/4	0	0.0
O	COMPUT AUTO REP SVC	4- 10	7 3/8	0	0.0
O	COMSHARE	6- 19	18 1/2	+ 1/4	+1.5
O	CULLINANE CORP	14- 33	17 1/2	0	0.0
O	DATA DIMENSIONS INC	4- 9	5 1/8	0	0.0
O	DATATAB	1- 2	3/4	0	0.0
N	ELECTRONIC DATA SYS.	15- 25	19 1/8	+ 1/4	+1.3
O	INSYTE CORP	1- 3	1	- 1/8	-11.1
O	IPS COMPUTER MARKET.	2- 3	3	0	0.0
O	KEANE ASSOCIATES	3- 6	4 1/2	+ 1/8	+2.8
O	KEYDATA CORP	1- 3	1 1/2	0	0.0
A	LOGICON	10- 19	12	+1 1/8	+10.3
A	NATIONAL CSS INC	15- 36	26 1/4	+1 7/8	+7.6
O	NATIONAL DATA CORP	7- 13	8 5/8	0	0.0
A	ON LINE SYSTEMS INC	12- 30	19	- 3/8	-1.9
N	PLANNING RESEARCH	4- 10	6 1/8	+ 3/8	+6.5
O	PROGRAMMING & SYS	1- 1	1 [illegible]	0	0.0
O	RAPIDATA INC	3- 7	4 1/4	0	0.0
N	REYNOLDS & REYNOLDS	18- 36	26 3/4	0	0.0
O	SCIENTIFIC COMPUTERS	3- 9	5 7/8	+ 3/8	+6.8
O	TYMSHARE INC	14- 33	31	+7	+29.1
A	URS SYSTEMS	5- 8	6 7/8	+ 1/4	+3.7
N	WYLY CORP	1- 7	4 5/8	+ 3/4	+19.3
	PERIPHERALS & SUBSYSTEMS				
N	ADDRESSOGRAPH-MULT	14- 32	22	+ 1/2	+2.3
O	ADVANCED MEMORY SYS	7- 16	13 3/4	+1 3/8	+11.1
N	AMPEX CORP	10- 19	14 5/8	- 1/8	-0.8
O	ANDERSON JACOBSON	5- 10	5 7/8	+ 1/8	+2.1
N	APPLIED DIG DATA SYS	9- 22	11 1/8	+ 7/8	+8.5
O	BEEHIVE INT'L	7- 7	2 7/8	+ 1/8	+4.5
A	BOLT,BERANEK & NEW	6- 14	12	+ 3/8	+3.2
N	BUNKER-RAMO	10- 20	16	+1 1/4	+8.4
A	CALCOMP	3- 13	6	+ 3/8	+6.6
O	CAMBRIDGE MEMORIES	3- 9	4 5/8	- 1/8	-2.6
N	CENTRONICS DATA COMP	16- 37	29	+2 1/2	+9.4
O	COGNITRONICS	1- 4	1 1/2	0	0.0
O	COMPUTER COMMUN.	4- 6	5 3/8	+ 1/8	+2.3
O	COMPUTER CONSOLES	4- 10	7 3/4	- 1/4	-3.1
A	COMPUTER EQUIPMENT	3- 8	4 1/8	+ 1/8	+3.1
O	COMPUTER TRANSCEIVER	1- 3	4 1/2	+ 3/8	+9.0
O	COMPUTERVISION CORP	9- 30	26	+2 3/4	+11.8
O	CONTEN	9- 38	15 3/4	+ 1/2	+3.2
N	CONRAC CORP	13- 24	14 3/4	+ 3/4	+5.3
O	DATA ACCESS SYSTEMS	3- 14	10 1/4	- 1/4	-2.3
O	DATA 100	9- 20	19 1/2	0	0.0
A	DATA PRODUCTS CORP	14- 25	17 1/4	+ 1/2	+2.9
O	DATUM INC	2- 6	3 3/8	+ 1/2	+17.3
O	DECISION DATA COMPUT	2- 6	3 1/4	+ 1/2	+18.1
O	DELTA DATA SYSTEMS	1- 1	3/8	- 1/4	-40.0
O	DOCUMATION INC	6- 34	22 1/4	+ 1/8	+0.5
O	DATARAM CORP	6- 32	17 1/2	- 1/2	-2.7
N	ELECTRONIC M & M	4- 9	4 7/8	+ 3/4	+5.4
O	FABRI-TEK	1- 2	1	+ 1/8	+14.2
O	GENERAL COMPUTER SYS	1- 3	2 1/4	+ 1/4	+12.5
O	GENERAL DATACOMM IND	9- 21	13 1/2	- 1/4	-1.8
N	HAZELTINE CORP	16- 17	12 5/8	+ 1/2	+4.1
N	HARRIS CORP	17- 36	29 1/2	+ 3/4	+2.4
O	INFOREX INC	6- 11	6 3/4	- 1/8	-1.6
O	INFORMATION INTL INC	7- 12	9	+1 1/2	+20.0
O	INFOTON	1- 3	2 3/4	+ 1/4	+10.0
O	INTEL CORP	39- 62	52	+3 1/2	+7.2
A	LUNDY ELECTRONICS	4- 8	4 1/2	0	0.0
O	MSI DATA CORP	10- 19	11 5/8	+1 5/8	+16.2
N	MEMOREX	27- 50	30 3/4	+1 1/4	+4.2
N	MOHAWK DATA SCI	6- 15	9	+ 1/8	+1.4
O	OMEX	2- 6	5 1/2	0	0.0
O	PARADYNE CORP	9- 17	10 1/4	0	0.0
O	PENRIL CORP.	5- 12	9 1/8	- 1/8	-1.3
N	PERTEC CORP	9- 17	12	+ 3/8	+3.2
A	POTTER INSTRUMENT	2- 2	1 3/4	0	0.0
O	QUANTOR CORP	2- 5	2 3/4	0	0.0
O	RECOGNITION EQUIP	7- 13	7 3/4	+ 1/8	+1.6
O	SCAN DATA	1- 5	2 1/4	+ 3/8	+20.0
N	STORAGE TECHNOLOGY	19- 46	32 7/8	+1 7/8	+6.0
O	T BAR INC	11- 20	17 1/4	+1	+6.1
O	TALLY CORP.	4- 14	13 3/4	0	0.0
A	TEC INC	6- 13	7	+ 1/4	+3.7
N	TEKTRONIX INC	33- 50	49 3/8	+1 5/8	+3.4
N	TELEX	3- 9	5 3/4	+ 1/4	+4.5
O	TESDATA SYSTEMS CP	9- 23	9 1/2	+ 1/4	+2.7
O	WILTEK INC	1- 2	3/4	- 1/4	-25.0
	SUPPLIES & ACCESSORIES				
A	AMERICAN BUS PRODS	6- 11	7 1/8	0	0.0
O	BALTIMORE BUS FORMS	2- 4	1	- 1/2	-33.3
A	BARRY WRIGHT	14- 31	30 3/4	+1 3/8	+4.6
O	CYBERMATICS INC	1- 1	5/8	0	0.0
O	DUPLEX PRODUCTS INC	13- 30	16	- 1/4	-1.5
N	ENNIS BUS. FORMS	8- 17	12 1/2	+ 1/2	+4.1
N	3M COMPANY	43- 66	63 5/8	+ 1/4	+0.3
O	MOORE CORP LTD	26- 34	27 1/2	+ 1/4	+0.9
N	NASHUA CORP	18- 37	23 3/4	0	0.0
O	STANDARD REGISTER	20- 27	23 1/2	+1 1/4	+5.6
P	TAB PRODUCTS CO	8- 16	11	+ 3/8	+3.5
N	UARCO	19- 51	50 1/2	+ 1/2	+1.0
A	WABASH MAGNETICS	10- 22	14 3/8	+ 3/8	+2.6
N	WALLACE BUS FORMS	18- 33	22 5/8	-1	-4.2

EXCH: N=NEW YORK; A=AMERICAN; P=PHIL-BALT-WASH
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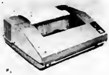

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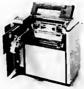

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